

TEST SYSTEMS
FOR ELECTRONIC PRODUCTION

**CUSTOMER-SPECIFIC
TEST SYSTEMS
FOR ELECTRONIC PRODUCTION**



In today's fast-paced world of electronic components, it is important to maintain the relation to its own history and origin. MCD Elektronik is closely related to the Northern Black Forest region since its foundation and attaches great importance to its roots. By combining high-tech and tradition, modifiable and scalable measurement and test system are developed to deliver customer-specific solutions for the areas of optics, acoustics, haptics and sensors. The integration in industrial line production also becomes a more and more important part for the MCD systems by innovative developments.

We specialize in the development of creative solutions for demanding application. Our philosophy is: "Creating future instead of chasing trends. We convince with hearty ideas and accurate, reliable measurement technology beyond the decimal point."



MCD's Online Shop

- Immediate price calculation incl. delivery
- Industry quality „Made in Germany“
- Current discounts for existing customers
- Spare parts available around the clock
- Software licenses in a simple and direct way

Measurement Technology around the clock! Register now:

 [**shop.mcd-elektronik.com**](https://shop.mcd-elektronik.com)

Current news, product and project descriptions can be found here:

 [**mcd-elektronik.com**](https://mcd-elektronik.com)

Please contact us anytime:

 [**info@mcd-elektronik.de**](mailto:info@mcd-elektronik.de) /  **07231-78405-0**

1st Edition, Version 5.4

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Other product and company names are sometimes registered trademarks of their respective companies.

The prices in this book are net plus VAT. We recommend a separate inquiry so that we can make an individual offer. We will send you a budget quotation on request.

The price list contains only one part of our extensive product range.

Up-to-date price list: November 2019

Valid until November 2020

Please inquire about current prices. All offers in this price list are subject to change and without error guarantee!

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Printed in Germany

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„He who ceases to become better
has ceased to be good.“

Philip Rosenthal

Preface



Bruno Hörter
CEO



Petra Noske-Mahseredjian
CFO

Founded with a vision in 1983, MCD Elektronik is the world's leading supplier of measurement and control systems. We convince through intuitive flair for measurement technology and deliver results for sensitive test procedures.

Today, you find our clientele in more than 50 countries and local offices in Hungary and China help us serve our customers locally. In our newly built MCD center we hardly have the time to look back at over 35 years of creativity and innovation since management and staff are constantly full of new ideas and energy.

Ever aware where we come from, we are proud of the interaction between technology and tradition here at our home region, the Black Forest.

In my anniversary speech I ventured a look into the future:

"Our creativity and innovation will continue to lead us. In the future, we will keep working on developing our products and tackling challenges and new tasks with enthusiasm. From today's perspective, the future looks very good. We will be in a position to specialize more and more in the growing demands of our customers in full competence and enthusiasm. In addition to the highest attained technical standards, we will continue to do everything in accordance to our personal and corporate philosophy in terms of care for our customers. Service and availability will remain our top priorities. Based on these proven pillars, the healthy growth of our company will stand strong and firm..."

As Philip Rosenthal said, "He who ceases to become better has ceased to be good."

Here you find all important facts about our medium-sized company. A view into the history beginning with the foundation, to the anniversaries up until today attest the urge for innovation, perfection and customer satisfaction. The long-standing success of the business is owed to the committed employees who are available to implement projects quickly and flexibly to all demands with huge engagement, creativity and competence.







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Reception Area



Installation of Underfloor Heating



MCD Center





On November 2011, we moved into our new headquarters in the industrial park in the 'Dammfeld' area in Birkenfeld, Germany. Since then, we had the pleasure of welcoming many visitors and are pleased with the consistent positive impressions left behind.

During the planning phase, we placed our main focus on the needs of our customers, employees and of course, an optimal work flow. We feel comfortable here at our headquarters which has become more than just a workplace.

Our various communication centers serve as a place where we can hold informal conversations, exchange business information, or develop new ideas. We now have plenty of room for new ideas and for healthy growth.

Everything has been thought of, high-speed fiber optic data links, training rooms, cafeteria with catering, meeting rooms, show rooms and a gym for our employees. There was nothing left out.

Our offices in Hungary and China can even benefit from direct access to our data center.

We are very pleased with our headquarters and even more so to have accomplished a big step towards the future.



Come, visit us!
Take a walk through
the several rooms of
our company.





Test System for Radio Transmitter



First Automatic Test System



First MCD VideoAnalyzer





...is measurement technology to the decimal point. We love the challenge; therefore, we develop customized innovative test systems "Made in Germany" with highly skilled technicians and engineers.

History

In 1983 the ground stone was laid for a successful future. Four young men had a vision of a product that can be used worldwide with quality superior to all competition. In their spare time, they developed an attenuator to control the RF level of transmission and test equipment. After many long hours of development and testing, their vision became a reality. An attenuator with incredible durability and precision was developed.

Shortly after, they found a Danish company, which wanted to integrate this attenuator into their stations and to market it worldwide. It had already been clear then that the preparation of the calibration line was only the beginning of what was to come. The passion for customer-specific measurement technology was already present and only growing.

The success of this product has shown us that it pays off to approach seemingly impossible tasks with expertise and creativity. And even today, we realize every single idea for the same reasons as we did back then.

Today

MCD is a privately held company that delivers the world's most complex testing and automation technology. The systems are used by major corporations as well as for production of medium-sized companies and testing of electronic and mechatronic assemblies. With the test systems of MCD it is possible to test, for example, vehicle components, such as electronic control devices, steering wheel modules, switches, radios and navigation systems.

They range from simple test fixtures for product validation through to fully automated test cells, which are integrated into production lines. Customers in the automotive, aerospace, medicine, energy and household appliances sectors have their test systems developed and manufactured by MCD.

Our developments are innovative. This is because they come from the application and they come from our customers. Often our customers are the innovators. On the basis of good cooperation with our commitment, we build MCD measurement technology further. We provide everything from the concept to commissioning, on site. At MCD, you receive everything from one hand.



MCD Company Group



MCD Partners



“TOP 100” Seals for the Awards
as an Innovational Leader

We provide everything from the concept to commissioning, on site.
At MCD, you receive everything from one hand.



With our medium-sized enterprise, we are among the technological leaders when it comes to complex, mechatronic and fully automated test and measurement systems.

Business

- Founded in 1983
- Owner-managed
- Headquartered in Birkenfeld
- 80 employees worldwide

Quality

- Certified according to DIN ISO 9001:2015

Turnover

- 12 million EUR

Partners

- Meilhaus Electronic GmbH
- ASYS Automatisierungssysteme GmbH
- Digitaltest GmbH
- Engmatec GmbH
- GÖPEL electronic GmbH
- GENTHNER SystemTechnologie
- TOELLNER Electronic Instrumente GmbH
- Leitec Test Solutions GmbH

Group

- MCD Elektronik GmbH
- MCD Office Hungary, Budapest
- MCD Office China, Shanghai

Customers - Industry

- Automotive
- (Special) Machine
- Plant Engineering
- Medical
- Defense and Security Technology
- Quality Technology
- Household Appliances
- Sensor- and Aircraft Construction

Area of Responsibilities

- Project Planning
- Construction
- Mechanics
- Software
- Application
- Production
- Documentation
- Commissioning
- Training
- Development
- Calibration



First Fair 1987



Start of Construction of the New MCD Headquarters



30 Years of MCD Elektronik

First Fair

Under the motto, "To make the impossible possible", MCD presents itself at the PRO-DUCTRONICA Fair 1987 in Munich for the first time. The interest is enormous.

Endurance Test for Hair Curlers

One of the special developments of that time includes a test bench for long-term testing (over a time period of several 1000 hours) of gas-powered hair curlers.

Olympic Tower

The event „Hightech at the Olympic Tower“ is established at the annual fair calendar.

1983

1987

1993

1998

2003

2004

Visions and Young Men

For young men have a vision. They develop an attenuator with incredible durability and precision to control the RF level of transmitting and test equipment.

Measure, Test, Match with MCD Intellect

MCD develops many special devices and machines for the most different requirements, and tests, among other things, radio clocks, automotive components or Pay-TV decoders.

Productronica at Munich

During the PRODUCTRONICA in Munich, MCD presents measurement systems, control functions and the MCD software with integrated core interpreter.



New Headquarters

MCD sets a further high standard by establishing its new headquarters. The developments are consistently headed towards the future.

Internationalization

MCD expands its international on-site support with permanent branch offices in Hungary and China.

2008

2011

2013

2015-17

2018 & 2019

MCD North America Inc.

MCD continues on its path of growth and establishes an operational subsidiary in the USA - MCD North America, Inc.

30 Years of MCD

The 30th company anniversary is celebrated with events for several days.



„TOP 100“ Innovator

MCD is awarded as one of the most innovative medium-sized companies in Germany at the “TOP 100” contest two times in succession.





MCD Delegation with Mentor Ranga Yogeshwar at the "TOP 100" Ceremony



MCD Service Documentation



DIN EN ISO Certification of MCDs Quality Management

Quality requires care and reliability to the decimal point.
We take care of that.



Together with our customers we design test systems that ensure the quality of their products. Thus, quality and customer satisfaction is our highest priority and is the basis of our daily work. The framework of our daily work forms our quality management, which is fulfilled by our MCD employees. Here, each employee can state his / her suggestions for improvement from his / her experience. These are discussed and analyzed at our QM meetings. That way we continuously make improvements in order to optimize customer-oriented work processes.

In addition, two internal audits are conducted annually, in which our quality team ensures that the quality of MCD is constantly evolving. All of these procedures are reviewed by our team. Through the use of customer satisfaction surveys, employee surveys and internal audits, we regularly put ourselves to the test. This quality is certified by TÜV Süd according to

DIN EN ISO 9001:2015 certification.

For its focused engagement towards research and development, MCD Elektronik was furthermore awarded as one of the most innovative medium-sized german companies at the "TOP 100" contest. The independent company analysis showed that MCD convinced in the years 2018 and 2019 especially in the categories "Innovative climate" and "Innovation success".

What also distinguishes our Quality

Years of Experience -

We have been active and successful in the market since 1983.

Fast Service -

In emergencies we are on the job. In case of failure, our technicians can be there within 48-hours, regardless of location.

Full Service -

We offer everything from concept to commissioning and completion of a project and help you find solutions to your problems.

Dependability -

We know the competence and performance capabilities of our products in detail. This functional safety of our products is an excellent foundation for customer-specific applications.

Sustainability -

Requirements may change; therefore the usage of your measurement system should adapt to change as well. No problem for MCD: Our instruments and systems are expandable and can grow with your needs. Today in the development department, tomorrow in production.



Meilhaus Cooperation Event
„Hightech at the Olympic Tower“



MCD Test System with
an Engmatec Logo



MCD Products at the
Meilhaus Online Shop

United we are strong!



We are an open-minded and partner-oriented business. Through collaboration with automation partners, complete assembly and manufacturing plants with an integrated test can be created by us.



Meilhaus Electronic GmbH

With headquarters in Alling near Munich, ME belongs to the leading European designers, manufacturers and sales companies in the field of computer measurement and interface technology. Together with Meilhaus, we offer professional applications from MCD software and Meilhaus data acquisition boards.

www.meilhaus.de/en



Engmatec GmbH

The Engmatec Corporation, headquartered in Radolfzell on Lake Constance, has provided for many years customer-specific solutions in automation, test and measurement technology.

www.engmatec.de



ASYS Automatisierungssysteme GmbH

The Asys corporate group, headquartered in Dornstadt near Ulm, develops and manufactures handling equipment, process and special machines for the electronic and solar industries and is also a key player in terms of process automation.

www.asys.de



Digitaltest GmbH

Automated test systems (AET) for electronic circuit boards as well as software solutions for automating production and quality management systems are developed at Digitaltests headquarters in Stutensee and their international partner locations.

www.digitaltest.com/en



Circuit Board from Cooperation
Partner Leotec for a Customer Project



Göpel Gate Logo



Cooperation Project with
Dr. Wiesner Steuerungstechnik





GENTHNER SystemTechnologie

The company from Birkenfeld-Gräfenhausen, provides assemblies / part production as well as construction optimization and CAM-DNC-programming as a strategic partner to companies in the areas of medical technology, optical and measuring systems, automation, aerospace and mechanical engineering.

www.genthner.com



Leitec Test Solutions GmbH

As an expert partner in the fields of test engineering and PCB processing, the Leitec Test Solutions GmbH from Holzgerlingen stands for Automatic Optical Inspection (AOI), fixture constructions for equipped assemblies as well as for first-sample testing and comprehensive service.

www.leitec.info



GOEPEL electronic GmbH

As a leading provider GOEPEL electronic GmbH from Jena develops and manufactures intelligent solutions for the test of mounted PCBs and electronic devices. MCD is „select member“ of the GATE programm, a strategic development partner and acts as a „value added reseller“ for software and hardware to support the GOEPEL technologies and perspective developments.

www.goepel.com



TOELLNER Electronic Instrumente GmbH

Since 1972 electronic power supply units and generators from TOELLNER Electronic Instrumente GmbH are produced after high quality and safety standards. Companies in the fields of automotive, electronic and automation profit from the products manufactured in Herdecke.

www.toellner.de



MCD Trainees and Students



Student Engineering Academy



Graduate Marcel Bräuninger





We pass on our strengths and push ahead vigorously with the training of professionals. Through our commitment, we want to be a role model and help shape our future economy and the region.

It is very essential for MCD to not only develop new products, but also to develop new business. This requires having first-class professionals on board and promoting their potentials. Just as MCD had enthusiasm and passion for technology then, we want to encourage and inspire young people with that same vibe today.

Every year, MCD hires 2-3 trainees / students to be trained. The trainees are introduced and integrated in almost every department. With confidence and responsible tasks, we want to awaken joy and enthusiasm at work. It is important for us to have experienced staff working closely with the young talents. That way, both sides can learn from each other – hands-on experience on the one hand, and new innovative ideas on the other.

In addition to the numerous training courses, we offer young people and students the opportunity to get a glimpse of work in real life. We encourage interns to get involved in all our departments in order to facilitate the correct career choice.

We also offer students qualified support for their theses and internships. The work will not only be put on paper but implemented as well. It is not uncommon here that product development is promoted and marketed.

In cooperation with the Chamber of Commerce, the Student Engineering Academy and the Professional Education GmbH, workshops and project days for pupils and students are organized by the trainees. Here, students are allowed, for example, to write software programs that perform acoustic tests on their own MP3 players and then present their findings. In this case, girls especially lose touch aversion to technical careers. In cooperation with these institutions, we encourage new methods of practice-oriented learning and the young professionals of tomorrow.



Adapter Test



MCD Application



MCD Summer Party





Through the MCD community we represent ourselves and the topics that command our involvement. Click through! We look forward to great conversations and feedback. In order to obtain mobile information, activate the QR reader on your mobile device and scan the barcodes below.



facebook.com/mcdelektronik



xing.com/companies/mcdelektronikgmbh



youtube.com/user/mcdelektronik



twitter.com/mcd_elektronik



mcd-elektronik.com



Company Football Team



MCD Drinking Bottles



Fitness Center





MCD has a lot to offer from a sports perspective as well - from the company's own gym, to equipping our employees with running and cycling jerseys as well as sponsoring the first female handball team, TV Birkenfeld. Furthermore, a MCD company football team was established by employees enthusiastic about football, and competes with other companies and hobby teams at various regional events.





Attila Puskás



Lance Wen



Gergely Boross





MCD Test Systems are present in over 50 countries worldwide. To remain competitive for a long time in the international market and to be able to guarantee permanent on-site support, MCD branch offices in Budapest, Hungary and Shanghai, China were established.

Due to the growth of the Eastern European and Asia-Pacific region, especially in the automotive sector, and the increase of demand for on-site service, MCD founded its subsidiaries there. Controlling and planning of projects, as well as the most of the added value, still takes place at the headquarters in Birkenfeld, Germany.

MCD is proud to present confident representatives in its branch offices in Shanghai and Budapest. Its members play a vital role in the processes of project preparation, commissioning and training, as well as the realization and presentation at local trade fairs.

So, in close cooperation with the AHK Greater China, part of the German Chamber of Industry and Commerce, it was possible to establish an „office-in-office“ concept for the MCD subsidiary in Shanghai. Since October 2014, the permanent on-site service represented by Chief Representative of China, Lance Wen, was able to start its engagement. Thereby, MCD offers the possibility to remain also an extensive after-sales services besides the local service support for the Asian-Pacific region. The positive development and the huge interest of customers make it possible to expand the branch office in Shanghai in the near future.

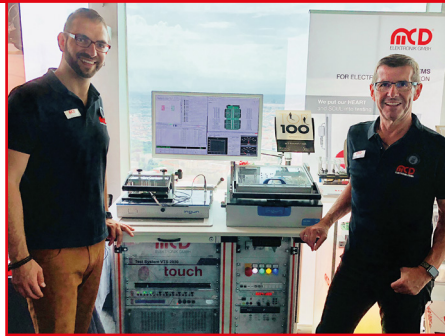
Already in the year 2010 MCD created a basis for a branch office in Budapest, Hungary. By founding a subsidiary under the leadership of Business Development Manager Labib Feidy and Chief Representative of Hungary, Gergely Boross, a greater focus on the Eastern European market was placed.

To be able to face up to the large amount of customer demand, the international presence was strengthened by Attila Puskás at the end of the year 2015. In this way the technical support in Hungary was also ensured. At the relevant trade fairs, for example the NEPCON in Shanghai or the Electronica and Productronica in Munich, the representatives support the MCD trade fair teams, allowing the customers to have a personal contact at these events.

All the MCD representatives are trained periodically at the headquarters in Birkenfeld to guarantee the expected quality of service. They work in close contact to the MCD Business Development, that assumes the central processing of customers' projects.



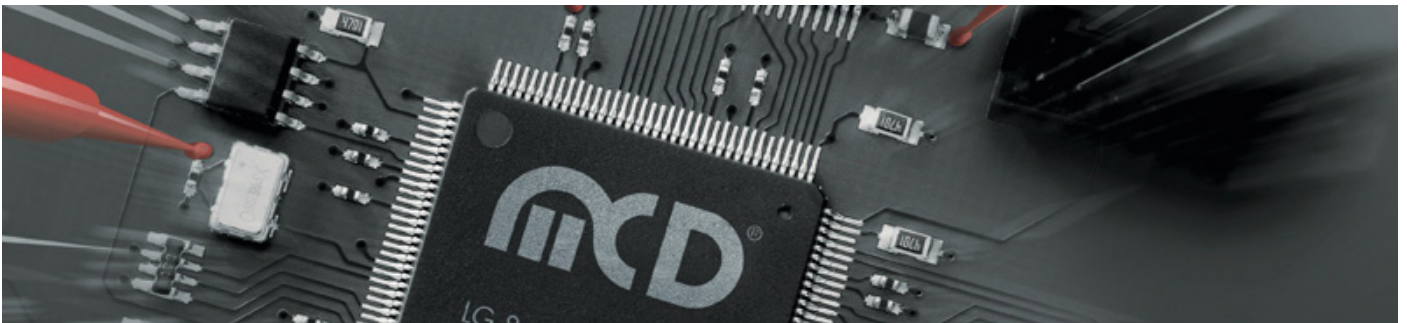
Roadshow Great Britain



Olympic Tower Munich



Electronica Munich





Meet MCD at the world's largest existing electronics trade shows, or in the Olympic Tower 181 meters above Munich. You are welcome to make an appointment and receive a free ticket. Log in or simply contact us. We look forward to your visit!



Productronica

New trade fair in Munich, Germany
Every two years in November
International trade fair for innovative electronics production

12.-15. November 2019,
Productronica Munich



Electronica

New trade fair in Munich, Germany
Every two years in November
International trade fair for components, systems and applications

10.-13. November 2020,
Electronica Munich



Hightech at the Olympic Tower

Olympic Tower in Munich, Germany
Measurement technology event
of Meilhaus Electronic

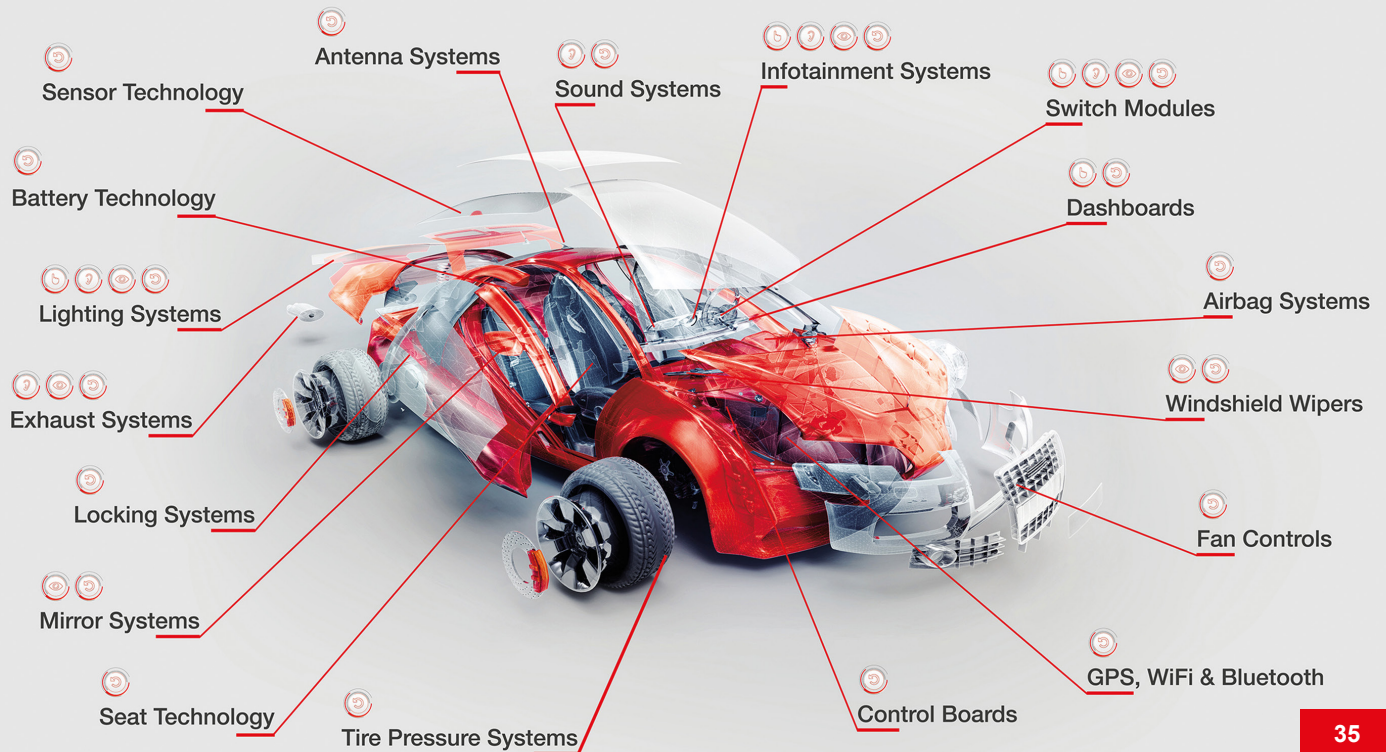
13.-14. May 2020,
Olympic Tower Munich

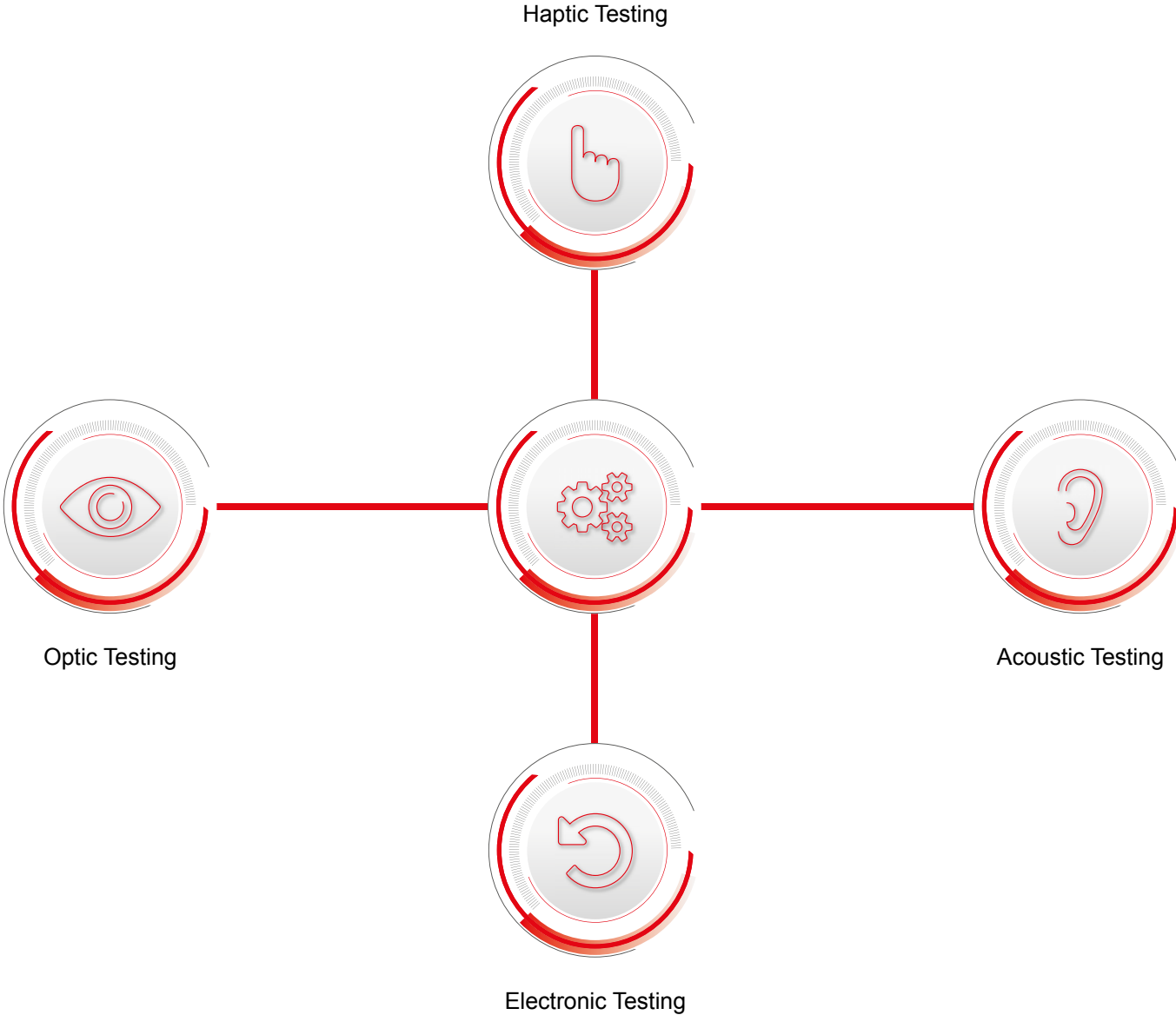
For more information about MCD Elektronik trade fair participations, visit our website:
www.mcd-elektronik.com/fair!

Because customers are all different, MCD systems are tailored to the individual requirements of our customers and we still remain flexible. This led to a wide range of products and solutions. In this chapter, a selection of our already existing projects is presented. It is often astonishing to which extent the MCD Team has already been able to successfully implement projects. You will find further insight into our product range in the following pages.



Reference Projects from the Automotive Area







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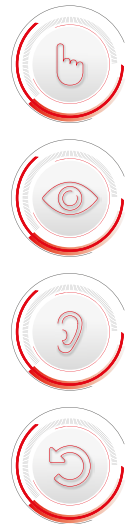
Robot Application



MCD's Stackable Modular Measurement System



RFID Cards as Chip or Card Variations with Receiver Module





With its test series „VTS 2030“, MCD sets new basics for whole new possibilities in the area of the test system construction. Due to this standardized concept, the height adjustments and the flexible adaptability, these measurement systems are totally optimized for customers' processes and quality requirements.

Individual Height Adjustment

- Standardization of systems via MCD VTS rack, adapters with Pylon interface and ULC Measurement Card
- Control of integrated lifting tables with retractable operating panel
- Adjustment of the work place to the physical requirements of the user
- Storable height adjustments

Individual Scalable Modular Measurement System

- MCD Modular Measurement System 2030 consists of a bus master, a maximum of 4 module carriers and up to 16 function modules
- Bus master provides an internal and external MCD bus for module control
- Generation of different operating voltages (3,3 V, 5 V, +15 V, -15 V)
- Additional 2x I²C bus master, 2x counter input and 2x connection on the codec for synchronous audio connections (variously usable)
- Function modules easily exchangeable
- Individual adaptation and extension of test adapters for special measurement tasks
- Easy realization of special DUT controlling, complex buses, diagnostic interfaces, parallel applications and much more
- DigitalOut, AnalogIn, Analog and Digital-Mux modules, expandable for example with multimeter, PWM, CAN/LIN or audio modules
- Stackability of single module parts

- Quick realization by MCD hardware and software standards

Individual Usage Mode by Chip Card System

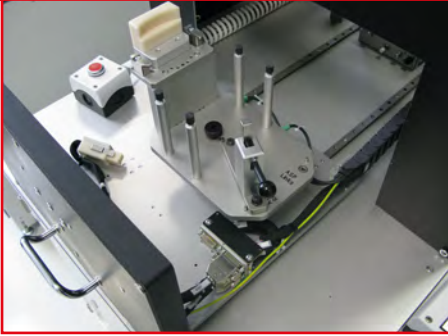
- Flexible user and authorization management via RFID chips
- Regulation of user specifications and precise time-recording system possible
- User registration by simply placing the chip cards on the receiver inside the keyboard tray

Individual Usability

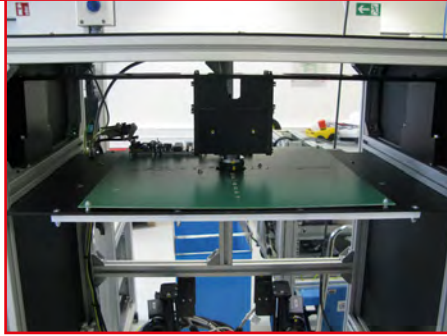
- Flexible utilization through diverse adaption possibilities and universal scalability of VTS 2030 standard systems
- Quick exchange of adapters via Pylon receivers on the table plate and by an interface block on the reverse side of the adapters
- Could be used for functional (manual or automatic), end-of-line or BSCAN tests, as repair, packaging and assembly station with minimal adjustments
- Usable within fully automated assembly lines by robot application

Individual Benefits for You

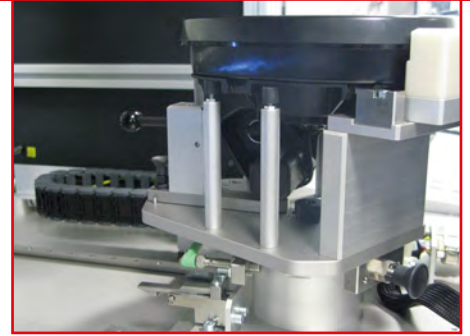
- Quick building through standardized stock
- Short changeover times through Pylon receivers
- Usable for tests of various assemblies
- Minimization of operating errors
- Increase of use efficiency



Drawer for DUT



Three Cameras for Optic Testing



Testing of the Mirror



Link to
Video

goo.gl/yqJtZV



With these systems, different types of external mirrors are fully automated tested.

Features

- Mirror alignment testing, Gearbox assembly
- Motor currents when shifting
- Adjustment angle, speed over image processing
- Recognition of curved, plan and spherical lenses
- Testing of automatic dimming of the mirror glass
- Reading of lettering on the mirror surface
- Retractable mirror
- Heating test
- Control via bus protocols

Equipment Components

- Measurement software TestManager CE, Toolmonitor Data Manager
- MCD LIN Bus Tool
- MCD Image Processing
- MCD UMS Systems

Application Examples

- Testing of internal and external mirrors
- Optic testing of components
- Testing of control panels
- Display testing
- Assembly checks
- Offline and Inline testing
- and much more



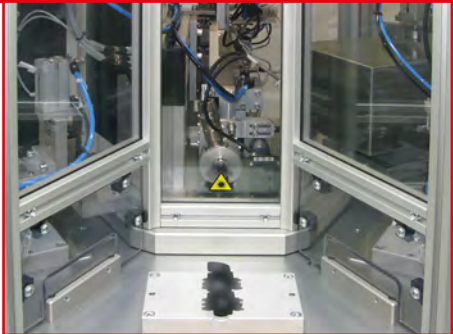
Inline Version



Backside with Defective-part Handling



Mobile Panel Operating Unit



Manual Loading Station





Besides electric functions, switches from the automotive industry have to be proved also for optic and haptic measurement. This hybrid rotary table tests switches at four stations and ejects perceived fail parts automatically using a pneumatic system. A trend analysis software is also integrated.

Features

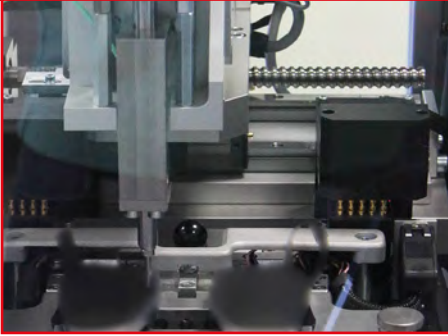
1. Manual Loading Station
 - Switch modules are inserted into a technical turntable with indexing and pneumatical contacting
 - Per turntable nest (4x, changeable) two DUTs are tested parallel
 - Automatical removal to NIO handling system
2. Testing of Assembly Capability
 - Swash circuit inspection for testing the plug pins
 - Engaging force test of connector housings and contacts
3. Optic Test
 - Testing of brightness, LED color, position and quality of button symbols
 - Use of special camera systems and MCD image processing software
4. Testing of Electric Resistance / Haptic
 - Measurement of force and displacement by precision drive with motion controller and touch sensors
 - 4-pole resistance measurement
 - Simultaneous recording and evaluation of physical measured values and switching points

5. Marking Station with a CO² Laser

- Labeling of IO parts with specific data, NIO switches get fail codes
- IO handling with manual removal of DUT by operator, defect parts are automatically removed via handling system

Application Examples

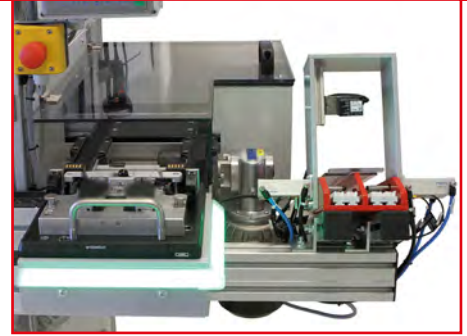
- Optic, haptic and electric test of switch modules
- Measurement of mechanical units
- Testing of operating units
- Force-displacement measurement
- Mechanical swash circuit inspection
- Final check of various devices
- and much more



Haptic Test of Paddle Switches



EOL Test System with integrated LED Visualization of Test Results



LED Visualization with DUT and NIO Slide





Electronic hand levers for motor vehicles, so-called paddle switches, are tested functionally, optically and haptically with this rotary table. A haptic test station with a haptic finger simulates shift operation and documents the measurement values.

Besides electronic measurements of operating current and short circuits, inserted DUTs are tested for luminance, LED color, illumination and quality of symbols by modern camera systems inside the automatic test procedure.

Features

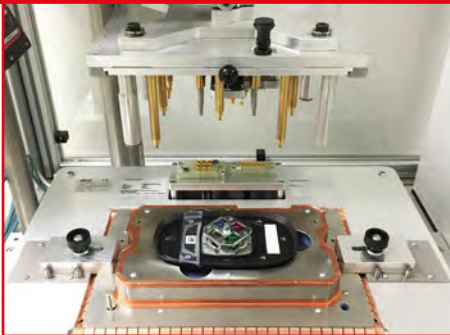
1. Manual Loading Station
 - Paddle switches are placed on an exchange adapter
 - Left and right paddle switches are tested simultaneously
 - Exchange adapter is transported through the test procedure by an integrated transfer system
 - Green or red LEDs display the test results directly at the loading station
2. Electronic Test
 - Measurements of voltage, operating current and short-circuits
 - Simultaneous contacting of both DUTs
3. Optic Test
 - Testing of illumination, LED color, illumination and quality of symbols
 - Cable core color detection of DUTs connection cables
 - Usage of special camera systems and imaging software MCD Toolmonitor Vision

4. Haptic Test

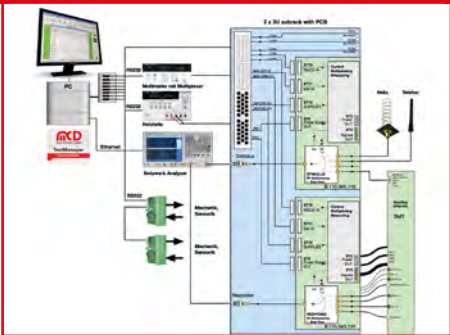
- Precision drive by linear motor with motor controller
- Sensors, measurement amplifiers and a haptic finger perform the shift operation
- Measurement of switching points, switching resistances and redundancy points
- Simultaneous recording and valuation of physical measurement data and switching points

Fixtures

- Modern camera system (luminance / USB connection)
- Integrated transport system
- Universal measurement system UMS1300
- Control functions via MCD Toolmonitors (SerIO, Visu, PowerSupply, Vision and Data Manager)
- Thermo label printer
- LED visualization of test results at loading station
- NIO handling via slide



Loading Station



Block Diagram



Downholder with RF Contacting





Multifunctional antennas of automobiles have to accommodate a variety of requirements. Constant motion, interfering signals or different wavelength ranges should not affect the signal strength, the range of the frequencies should be as comprehensive as possible. The EOLT includes the signal testing and the mechanical control.

Features

- Current and voltage measurements
- Frequency test from kHz to very high frequency range
- Testing of various signals:
 - Radio signals (AM, FM, DAB II)
 - Navigation signals GNSS (GPS, GLONASS)
 - Satellite signals (SDARS, TV)
 - Mobile and CB radio (also protected signals)
- Mechanical testing via sensors
- Examination of diagnostic functions
- Automatic detection and switching functions

Equipment Components

- Measurement software TestManager CE and Toolmonitor Data Manager, control systems by MCD Elektronik
- Specially developed helix antenna for stimulation of signals
- RF adaption
- Pneumatic controlled high frequency contacting
- 2D mini barcode scanner
- ULC rack with a network adapter
- Industrial PC

Application Examples

- Testing of signals and frequencies
- Testing of transmitting and receiving modules
- Testing of high frequency amplifiers
- Testing of telecommunication modules
- Testing of satellite receivers
- and much more



Pressure Station with Filter Regulator,
Valve Terminals and Pressure Sensors



Quick Connector for
Pneumatic DUT Contacting



Connected Small Heating Unit





Blowers of small heating units, that are used in air conditioning systems or floor heating systems of buses and trains, are tested with this test application. Multilevel blower testing, current and voltage measurements as well as density tests are performed with this testing device.

Features

- Functional testing of multilevel blower functions
- Measurements at the DUT with an ULC MSR Functional Card and programmable current sensors
- Density test via comparison procedures between input and output pressure
- Fast, manual contacting of DUTs via quick adaption
- Input and selection of individual production orders within serial production by MCD Toolmonitor Order Management
- Creation of a device label and the corresponding shipment documents

Application Examples

- Density tests
- Functional testing and EOL test of mechatronic assemblies
- Multilevel blower test
- and much more

Equipment Components

- Measurement software TestManager CE
- Control functions via MCD Toolmonitors (SerIO, ULC, Order Management)
- MCD ULC Multifunctional Card
- MCD Control Unit PIC8IO
- Programmable and configurable current transducer
- Pressure station with valve terminals, filter regulator and pressure sensors from FESTO
- Pneumatic adaption with quick connection technology



EOL Tester with Acoustic Sump



Transportation Box
Completely Locked



Mobile 19" Solution with Trolley





In times of electric vehicles and quieter engines, active sound generators (ASG) are used to create „real“ engine sounds. The generators are able to simulate the sound of engines according to the current rotation speed, torque and speed.

In the case of electric and hybrid vehicles, they also have a safety-relevant task to fulfill. According to the new NHTSA (National Highway Traffic Safety Administration) regulation, these vehicles must generate an audible sound (Acoustic Vehicle Alert System, AVAS) at speeds of 30 km/h or less to be acoustically perceptible to pedestrians.

Features

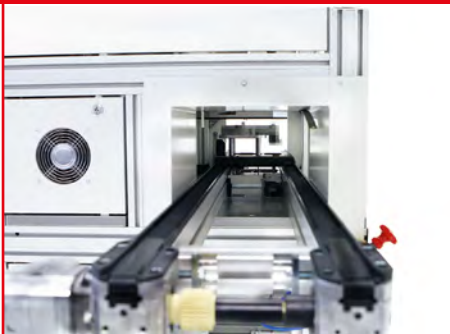
This EOL test system was developed to detect production errors like tightness of the case, damaged loudspeaker membranes, loose screw connections or grazing voice coils of active sound generators.

This is ensured by:

- The DUT that is mounted on an acoustic absorption plate
- MCD AudioAnalyzer that generates a special pulse, which covers all audible frequencies
- Impedance measurement that is carried out via the AudioAnalyzer, which is evaluated directly by a Toolmonitor in a Pass / Fail display

Equipment Components

- When placed on wheels, the EOL tester becomes a mobile test system in the form of a 19“ rack
- Completely lockable for transportation or when it is out of use
- Testing time per DUT under two seconds
- Measurement can be started from any laptop / PC
- Toolmonitor for evaluating the measurement has been implemented as a stand-alone software



DUT Transport System



Open Test Cell of the EOL Tester



Operating Panel with Touch Screen





Electric vehicles not only place new demands on battery and drive technology, but also on the comfort features such as interior air conditioning. So far, conventional vehicles have used the engine waste heat for the vehicle heater and have installed an air conditioning compressor directly at the powertrain to cool the vehicle.

In electric and hybrid vehicles, these devices need a separate power supply. Therefore an inverter is necessary, so that air conditioning compressors can still provide a pleasant indoor climate. This inverter converts the provided DC voltage of 380-490 V to a 3-phase AC voltage. Fully automated functional tests of these inverters are performed with this inline EOL test system.

Features

- Carrying and fully automated contacting of DUTs via an integrated transport system
- Testing of communication interfaces via LIN/CAN
- Testing of quality-relevant parameters of the output stages in partial-load operation (current consumption, switching times of output drivers, output current in normal operation and in case of errors, writing of customer data)
- Testing of two different inverter models is guaranteed without much modification effort

Equipment Components

- DC and high voltage power supplies
- PXI measuring system
- Current clamps
- PLC control unit
- 4 channel mixed-domain oscilloscope
- Touch screen monitor for easy, fast operation

Special Feature

In cooperation with our customer, National Instruments® software products such as the test management software „TestStand“ were used for this test system.



Automated Optical Inspection (AOI)



Pneumatic NIO Slide



Haptic Test in a Robot Cell





Consisting of five stations and two robot cells as special features, this test line includes haptic and optic tests of operating device panels and power switch modules for the automotive industry. The line is centrally controlled, managed and adjusted to various DUTs with the MCD Manufacturing Execution System Tool (MES-Tool).

Features

1. Haptic Test in Robot Cell
 - Testing with a 6-axis articulated robot
 - Dynamic rotary actuation and friction force test
 - Contacting and functional test
 - Mechanical swash circuit inspection via precision insertion
 - Controlled via MCD Toolmonitors (Robotics, TestManager CE and Graphical Analysis)
 - NIO handling by pneumatic slide with a pass-through sensor
2. Haptic Test in Robot Cell
 - Testing with a 6-axis articulated robot
 - Resistance and force-displacement measurement
 - Mechanical swash circuit inspection before contacting
 - NIO handling by pneumatic slide with a pass-through sensor
3. AOI Test of Operating Device Panels
 - Testing of LED color and brightness, position and quality of button symbols
 - Use of special camera systems and MCD Toolmonitor Vision

4. Haptic / Functional Test of Power Switch Modules

- Rotary actuation test and torque measurement
- Resistance value, rotation angle and force-displacement measurement
- Automatic contacting and functional test

5. AOI Test of Power Switch Modules

- Testing of LED color and brightness, position and quality of button symbols
- Check of switch illumination, day and night design and functional lighting
- Use of special camera systems and MCD Toolmonitor Vision

Application Examples

- Optic, haptic and electric test of operating device panels and power switch modules
- Measurement of mechanical units
- Robot-assisted haptic test
- Force-displacement measurement
- Mechanical swash circuit inspection
- Final check of various devices
- and much more



Manual Functional Test System



User Guide



Special Circuit Board





Also in the mid-range cars high-quality infotainment systems are used more and more. This test line was developed for a large Japanese manufacturer and is integrated into the production process to optimize it efficiently. Eight stationary test systems were therefore designed.

Features

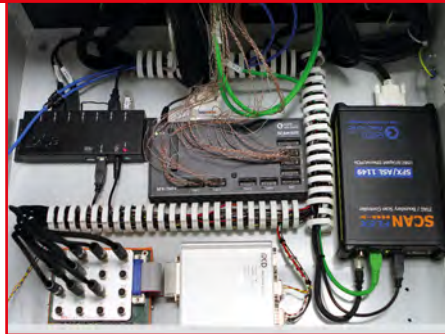
1. Inline BSCAN / Functional Test System for Mainboards
 - Automatic testing and programming of two mainboards
 - Tests are running parallel
2. Inline BSCAN / Functional Test System for Tuner Modules
 - BSCAN, functional test and programming of 12 DAB tuner modules simultaneously
3. Flashing Trolley
 - Trolley for parallel programming of up to 48 DUTs
 - Asynchronous process is possible
4. RunIn Trolley
 - Endurance testing in a climatic chamber for 48 head units (temperature range from -40° to +80° C)
 - Test of all devices and signal functions
5. Automatic Functional Test System
 - Testing of USB, Wi-Fi and Bluetooth components at about up to four assembled DUTs
 - Analog and digital measurements of tuner (AM, FM, DAB) and satellite reception
 - Testing of GPS and video signals, fan functions, interfaces, brightness and MOST communication
 - Free test potentials are realized and process is optimized automatically
6. Manual Functional Test System
 - Customer-oriented device test from user view
 - Hearing test, manual DVD functional test, functional usage of the controls
 - „Electronic Manual“ supports testing person in the respective language
7. Optic Test Stand
 - Connectors, cases, assembly, barcodes and labels are checked with camera systems
8. Delivery Place
 - Configuration of DUTs for target application and shipping

Application Examples

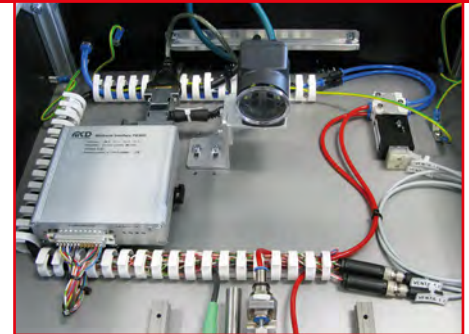
- Testing of infotainment systems
- Functional test of components / complete devices
- Testing of transmitting and receiving modules
- Testing of printed circuit boards
- Boundary Scan tests
- and much more



High Frequency End-of-Line Test



Boundary Scan Adapter



Packaging Test with Camera System





In order for Wireless Internet Access LTE modules to be able to offer strong functionality permanently, we have implemented a test line for the production of these Wi-Fi modules, consisting of the following three individual mobile stations: Boundary Scan, End-of-Line and Packaging Tests.

1. Station - Boundary Scan Functional Tester (FCT)

- Toolmonitor Data Manager for production control
- Programming of the module via USB connection
- Exchangeable fixture set with two extension positions for the different sized boards of the modules
- Boundary Scan hardware from Göpel
- MCD Toolmonitor BSCAN acts as an intrinsically intelligent link to the BSCAN Hardware
- LED measurement with LED Analyzer for testing of colors and intensity
- Pressing and testing the keys of controllable pneumatic cylinder
- BSCAN software development and determination of the test coverage at MCD
- Interface functions check by stimulation
- Functional test of the modules

2. Station - End-of-Line Tester (EOLT)

- Contacting the RF signals
- GSM, 3G, LTE and Wi-Fi Test
- RF power measurement
- RF adapter with interchangeable sets for different assemblies
- Automatic USB and SIM card contact
- Examination SIM card connectors
- Testing wireless communication interface
- Test the standby and alarm functions
- Check the dormant currents

3. Station - Packaging Tester

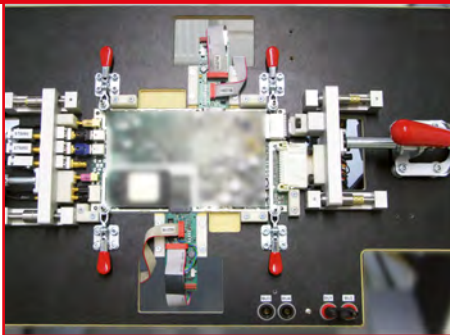
- Light-proof adapter with universal insertion possibility for different modules
- Image processing system with integrated lighting
- Label printer
- Code Card Printer
- Printing of labels and code cards
- Printing and equipment test via image processing
- MCD Label Generator

ULC racks in general

- Versatile, not bound
- ESD design, tabletop, painting
- Addition possible for 19" rack and individual development with DIN rail modules, assemblies and other elements



Repair Adapter



Contacting Front



Connection Box





Repair, offline and commissioning systems come into action wherever an inline plant is ruled out, because it is necessary to handle the test sample manually by an operator. The repair station consists of a table or rack work station with measuring and control devices and adapter with associated connection box.

Features

- Automatic voltage and current measurements
- Manual voltage measurements with probes and limit value control
- Programming of the boards
- Communication with the test samples via RS232, Ethernet, CAN, MOST, etc.
- Bluetooth and GPS Test
- Audio measurements
- Automatic transfer of test programs
- Keyboard simulation test
- Test of the serial input and output

Equipment Components

- Table or rack work station
- Measurement system UMS1300 ME
- Connection box
- Measurement software TestManager CE
- Repair and commissioning adapter
- Audio Gain Controller
- Control unit MIO1616
- Oscilloscope with interface and measurement functions via testing software

Application Examples

- Analysis of faulty parts in series production
- Test adapter for devices with small numbers
- Commissioning adapter for lab samples
- Tester for control panel with visual verification
- and much more

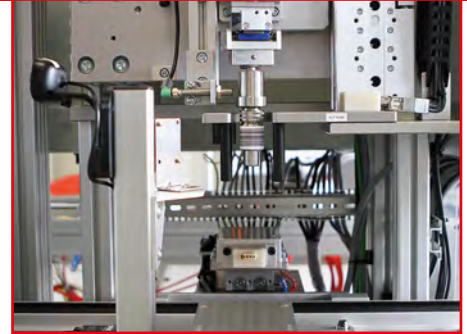
The adaption is designed as a swivel adapter. The solder side and component side are freely accessible for repairs or analysis from both sides. By inserting the removable mounting brackets, testing of PCB's as well as fully assembled test samples is possible. A series of test systems is also possible.



Supply and Assembly of a Seal Ring and Leakage Test



Automatic Feeding of DUTs to Test Station via Transfer Belt



Functional Test Station





To check the functions and tightness of mechatronic components automatically, this inline system was developed. The tester offers the possibility to adjust various types of DUTs with the help of manually replaceable components. Additionally, it is possible to carry out a complete test sequence or to pass through a repair operation.

The inline system consists of two stations. The first station is dedicated to the tightness test and the assembly of a shaft seal. The next step is a functional test. The DUTs, which are stored on carriers, reach both stations fully automated via a transfer belt.

Features

1. Tightness Test and Assembly of a Sealing Ring
 - Vacuum test for the tightness test by using a differential pressure measuring device
 - Sealing of the DUT (depending on the type) is carried out from above via a linear axis as well as from the front or rear
 - A sorting and feeding device now supplies a sealing ring, which is pressed onto the test item shaft via a handling system
 - Re-check of the tightness and correct assembly of the sealing ring by several tightness tests

2. Functional Test

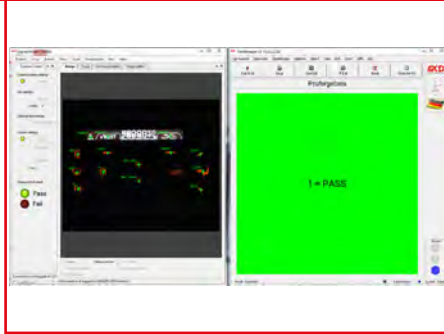
- Fixing of the DUT via hold-down device
- Contacting the DUT
- Simulation of external stops and high-precision application of braking torque with the help of a specifically developed load machine with angle measurement and repeat accuracy of $< 0.1^\circ$
- Depending on the type of DUT, the following values are checked and evaluated:
 - Current flows
 - Torque
 - Angles
 - PWM feedback
 - Hall signal, programming and testing

Equipment components

- MCD Brush Motor Controller
- Measurement software TestManager CE (2-fold)
- MCD Toolmonitor Data Manager
- MCD Toolmonitor SPS
- Several MechIOs from MCD Elektronik
- MCD ULC Multifunctional Card
- Sorting and feeding device
- Transfer belt from Stein Automation
- Differential pressure measuring device from ATEQ



Assembly Station with Manual Hand Press and Screwing Station



Toolmonitor COGNEX Vision for Optic Testing



Functional, Optic and Haptic Test of Operating Elements





This test station was developed for a supplier of truck air conditioning systems and combines the final assembly with functional, haptic and optic tests of control units and operating elements. This test system can be integrated in production lines by affiliated gravity roller tables.

Features

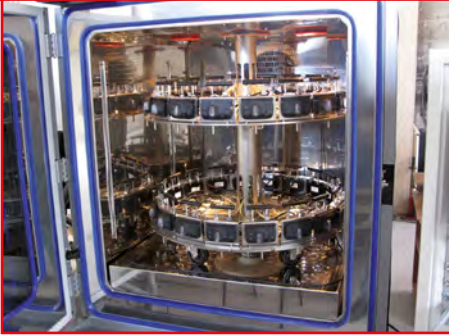
- Compression of pin headers and displays with a manual hand press
- Automated supply of necessary screws to mounting station with screw head
- Screw connection of housing, PCB and housing lid
- Functional test of DUT supplies in the MCD Testing Cell
- Signal test of air conditioning system control units in the MCD Testing Cell
- Haptic test of operating elements in the MCD Testing Cell
- Illumination and display test in the MCD Testing Cell

Application Examples

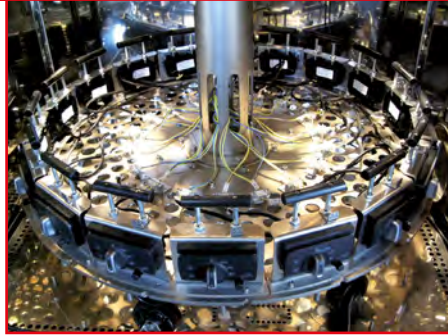
- Testing of control units and operating elements of air conditioning systems
- Final assembly of control units and operating elements
- and much more

Equipment Components

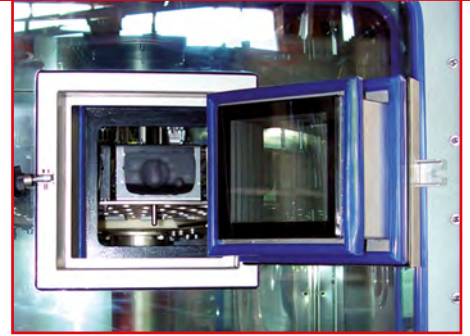
- Manual hand press from the company Schmidt
- Screw device from the company Deprag Schulz
- Feeding and sorting device from the company Deprag Schulz
- Gravity roller tables
- Platform scale for NIO handling
- MCD ULC rack
- Measurement software TestManager CE and MCD Toolmonitor COGNEX Vision
- Electronic control and coordination of test procedures via MCD control unit MIO1616
- Integrated label printer



Climatic Chamber



Rotating Carousel inside
Climatic Chamber



Control Valve for Manual Operation





A special RunIn system was sent to China. We were allowed to develop and manufacture one RunIn system for switching modules for a large automotive supplier. Thirty-six switches are monitored and tested in a temperature ranging from -40° to $+70^{\circ}$ Celsius.

Features

- Testing of the current consumption in the various work areas
- Signal test level and rise times
- Monitoring of switch positions
- Synchronous sampling of the output signals

Equipment Components

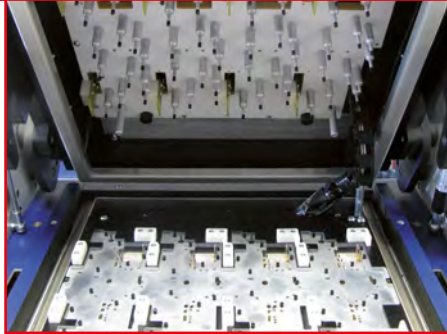
- Rotating carousel with two floors for inserting and connecting the switch
- Control valves for manual operation
- Cabinet with interface and ventilation unit
- Control unit with measurement technology and measurement software TestManager CE to perform the tests

Application Examples

- LDS modules
- GPS receivers
- Tire pressure monitors
- Tuners
- Automotive ECUs
- Head units
- Navigation components
- Audio amplifiers
- and much more



RF Adaption



Downholder and Needle Bed



Removable Cartridge





With our test applications for radio frequency modules we assure good quality of Bluetooth, Wi-Fi and UMTS signals in your car.

Features

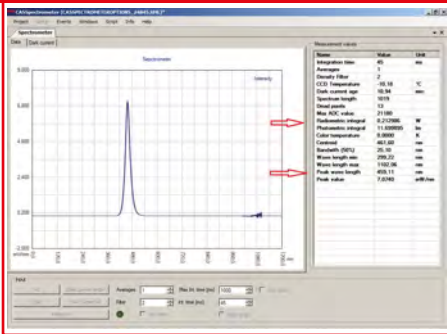
- Measurement of Bluetooth and Wi-Fi communications
- Current and voltage measurements
- Functional and structural testing
- Four modules are used and successively tested in the adaptation
- The mechanical handling takes over the control of the MCD PIC8IO

Equipment Components

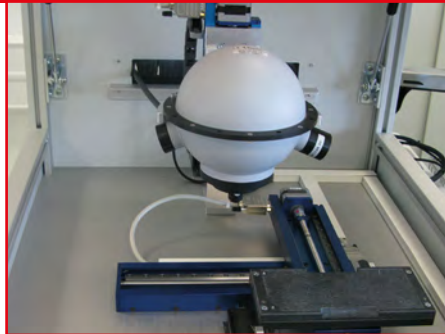
- Wi-Fi, UMTS and Bluetooth transmitter and receiver units
- RF adaption
- Mini 2D barcode scanner
- Adapter and removable cartridge are equipped with programmable memory cells which contain the calibration data

Application Examples

- Testing and calibration of sensitive assemblies
- Testing of vehicle control keys
- Testing of emergency equipment
- Examination of remote control
- Testing of telecommunication modules
- and much more



Spectrometer



Plane Table with Measuring Adapter



Measuring Adapter Spectrometer and Contacting





Test System for optic testing of LEDs in the medical field.

Features

- Measuring of the diode characteristics with source meter at different environmental conditions
- Sequential testing of 60 LEDs in use on a XYZ stand
- Luminous flux measurement with integrated sphere
- Measurement of the wavelength +/- 1 nm
- Optic power at various stages
- Measurement of characteristics
- Creating reports of the measurement process

Application Examples

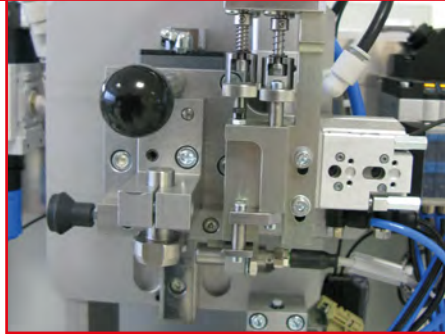
- Testing of LEDs
- Special test systems
- Mechanical test devices
- XYZ-enabled multi-test devices
- Automation of testing tasks
- and much more

Equipment Components

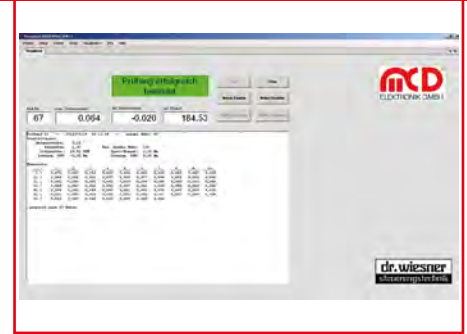
- Sourcimeter
- Spectrometer with integrating sphere
- Measurement software TestManager CE and Toolmonitor Data Manager
- ULC rack with special adaption
- Cover with screen
- Touch screen PC



Complete Device with
Coverage and Emergency Stop



„Test-Shot“ Latching



Display of Torque Values
and Operating Cycles





This tester is used for verification of inhalers and was developed, planned and produced in collaboration with the company Dr. Wiesner.

Features

- Testing of operating cycles
- Measurement and documentation of operating forces
- Monitoring of the life cycles
- Latch testing and mechanical actuation
- Torque measurement
- Acquisition of operating angle
- Fully automated testing and documentation

Equipment Components

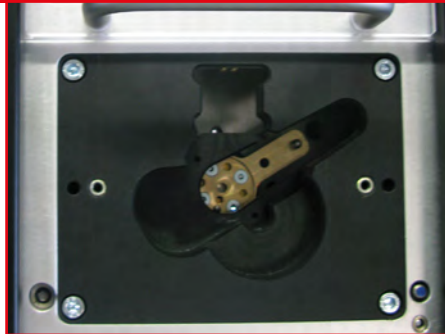
- Measurement software TestManager CE
- MCD ULC Multifunctional Card
- MCD TestSequencer
- Mechanical tester with force measurement, rotary encoders
- Touch screen PC

Application Examples

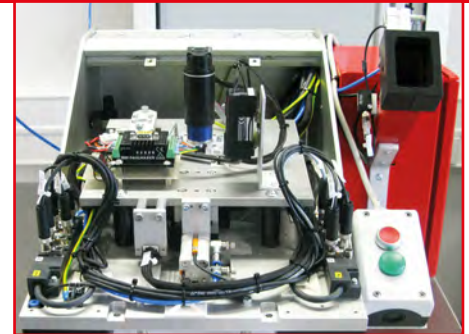
- Testing of mechanical components
- Endurance test
- Endurance run device for various components
- Force-displacement and angle measurements
- and much more



Rack with Measurement Technology



Insert Adaption



Mechanics





The sensors are responsible for the automatic headlight range control in the vehicle. The purpose here is that the driver always has the optimum illumination of the road, without blinding preceding or oncoming drivers.

Features

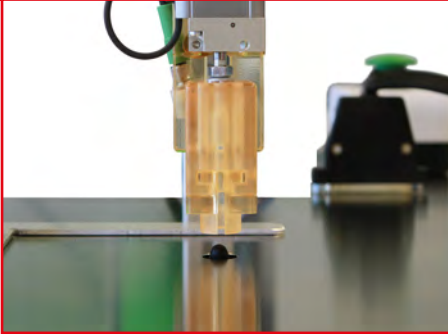
- Complete measurement range 360°
- Destruction of defective DUTs and disposal in a 'failed parts' box
- Type choice by checking the housing characteristics through light and color sensors
- Measurement of mechanical elements
- Force-displacement measurements

Equipment Components

- Touch screen monitor
- LabView® software application
- Special workplace
- Industrial PC
- 'Failed parts' box
- Service-friendly adaption

Application Examples

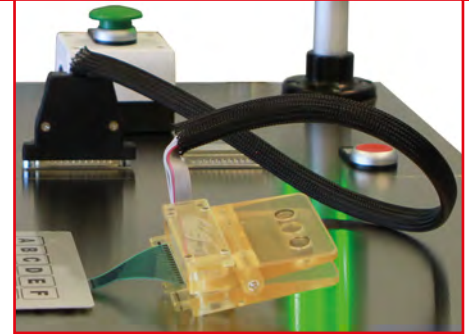
- Testing of controls
- Final testing of different devices
- Control unit test system
- Testing of photocells
- Testing of safety components
- Quality assessment in to / from delivery
- Testing and calibration of mechatronical components
- Testing of level sensors
- and much more



Button for Haptic Testing



Adaption with DUT



Universal Contact Clamp
for Flexible Lines





This Functional Test System was developed to test keyboards with Piezo effect. This special input system is used in hygienic sensitive clinics and in conjunction with equipment that must be protected against vandalism. The device has to be functionally tested in a comprehensive way with integrated haptic test.

Features

- Capacity check of the whole keyboards and single keys
- Short circuit measurement of single lines (testing among themselves and against each other)
- Charge measurement of single keys by automatic haptic actuation

Application Examples

- Functional test of keyboards with Piezo effect
- Testing of operating units
- Testing of sensors
- Testing of touch screen modules
- Testing of haptic input fields
- and much more

Equipment Components

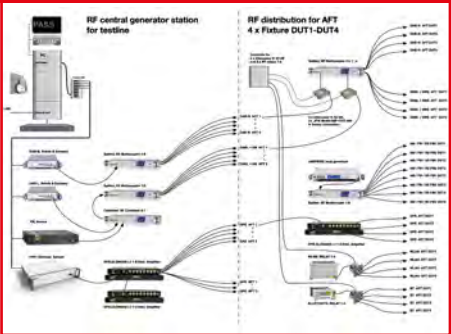
- Measurement software TestManager CE and control systems by MCD Elektronik
- MCD haptic measurement with Toolmonitor ULC
- Contact clamp for fast contacting of foil cables with different grid dimensions
- User-friendly sequence program with a detailed user guide
- Universal multiplexing and data logger system
- ULC rack with customer-specific adaption
- Industrial PC



Automatic Function Tester for Infotainment Systems



GLONASS Signal Programming



Signal Distribution for Production Line





The transmitter station „Central Generator“ was developed for testing of infotainment systems with the possibility to carry out various frequencies and signals. These are generated from the central generator and distributed to the automatic or manual function testers of head units.

Features

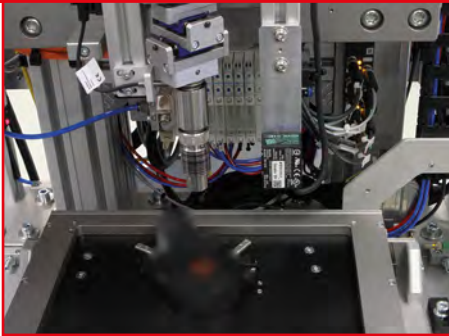
- Simultaneous creation of the following signals:
 - 8 x DAB+III
 - 8 x DAB+L
 - 15 x GPS, GLONASS, BeiDou
 - 8 x XM multibeam
- High-frequency distribution allows to supply an entire production line with different signals disruption-free
- Intensive control and monitoring
- RF level control

Equipment Components

- SFC compact modulator for generation of television and radio signals or Digital Audio Broadcasting (DAB)
- Avera signal generator for providing configurable XM multibeam signals
- GSS6300 signal generator for signal generation of various satellite-based navigation systems as GPS (US / EU), GLONASS (Russia), BeiDou (China)

Application Examples

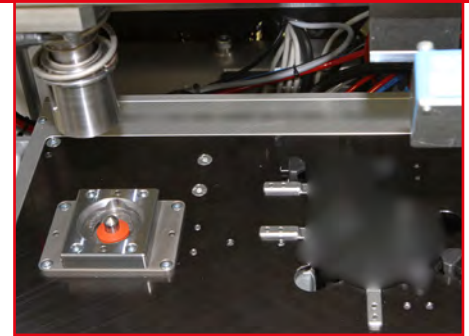
- Signal generations for infotainment tests
- Testing of digital radios
- Testing of satellite radios
- Testing of head units
- and much more



Testing Cell of the Functional Test System



Monitoring of a Triggered Rotation Angle while Testing



Exchangeable Cartridge for Tightness Test with Inserted Sealing Ring and DUT





For the functional testing and the testing of housing tightness of mechatronic assemblies, these test stations were developed. The first test system executes various functional measurements at so-called vehicle flap actuators. The second test system examines the complete tightness of the flap actuator housings.

By utilizing of a MCD ULC rack different DUTs can be tested in these universal systems. A drawer concept with exchangeable cartridges allows the future testing of further DUT types.

Features

1. Tightness Test of Flap Actuator Housings
 - Semi-automatic handling with insertion of sealing ring and DUT
 - Automatic start of test sequence by closing the drawer
 - Inclusion of sealing ring by vacuum tool and mounting via linear axis system
 - Mounting of sealing ring on the flap actuator shaft
 - Two-fold tightness test by overpressure and vacuum before and after mounting
2. Functional Test of Vehicle Flap Actuators
 - Running of pre-defined actuating positions
 - Simulated loading via programmable drive and brake torques
 - Angle measurement and testing of Hall sensor voltage at actuator limits and defined positions
 - Torque measurement during test sequence
 - Calibration test by evaluation of linearity
 - Current and voltage measurement

Equipment Components

- Modular test setup with a drawer concept and exchangeable cartridges for various DUT types
- Control via touch screen monitor, handheld and shaft scanners for barcode identification
- Electronic control and coordination of test sequences via MCD control unit MIO1616
- Control and documentation by measurement software TestManager CE, as well as Toolmonitor SerIO, Robotics, Serialline, Data Manager and ULC
- Integrated label printer for failure labels
- NIO handling via slide
- Linear axis system with servo axis inside the testing cell
- MCD ULC rack

Application Examples

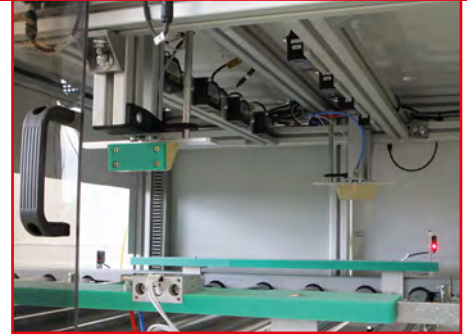
- Tightness test of mechatronic assemblies
- Functional test of vehicle flap actuators
- and much more



Optic Test System for Automotive Mirror Dispatch Boxes



Testing Cell of the MCD Test System



Sensors and Clamping Cylinders inside the Testing Cell



Link to
Video

youtu.be/c9BrCJOCfw



To ensure a complete and correct mounting of dispatch boxes for automotive mirror-casings, this fully automatic conveyor belt system was developed for an automotive supplier.

This optic test system combines a seven meter long conveyor belt, two lifting tables and a testing cell with triangulation sensors and clamping cylinders.

Features

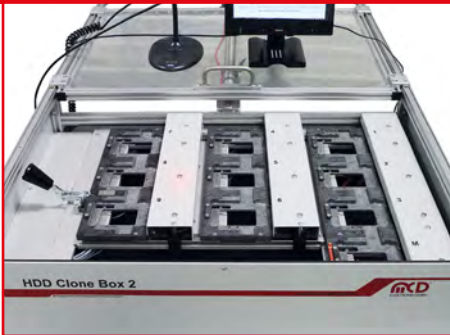
- Start of testing sequence by manually scanning of barcodes
- Automatic conveyor run of opened dispatch boxes into testing cell
- Indexing of box inlays by clamping cylinders
- Parallel distance measurement and testing of differences in altitude of the mounted automotive mirror-casings
- Color-independent controlling by triangulation sensors, that allows for a more flexible testing of various mirror-casings
- Evaluation of received signals
- Interruption of the conveying path by stopper cylinders in case of a „fail“ result
- Removal of successfully approved dispatch boxes and print of a shipping label at the end of the conveyor belt
- Controlling of the conveyor belt system via MCD LogicDesigner

Equipment Components

- Low profile lifting tables for insertion and removal of dispatch boxes
- Handheld scanner
- Fully automatic conveyor belt
- Triangulation sensors
- Clamping cylinders
- Pneumatic stopper cylinders
- Thermo label printer
- Control unit MIO1616
- Sensor Actuator Box
- Measurement software TestManager CE
- MCD Toolmonitor SerIO

Application Examples

- Production, shipment and packaging controls
- Completeness and presence checks
- Integration in a variety of different conveyor belts possible
- and much more



Desktop Station to insert the HDD Hard Drives

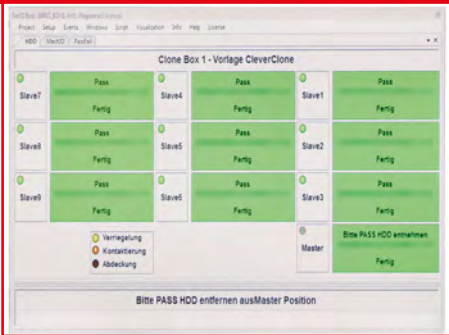


Diagram of a Complete Copy Status of the Hard Drives



Blue Position Sensors inside of the Desktop Station





The second generation of the HDD Clone Station's functionality was improved and is used for duplicating and verifying processes of HDD hard drives from the automotive sector. Two desktop stations with nine copy slots each allow a data transfer speed of up to 24 GB / minute.

Features

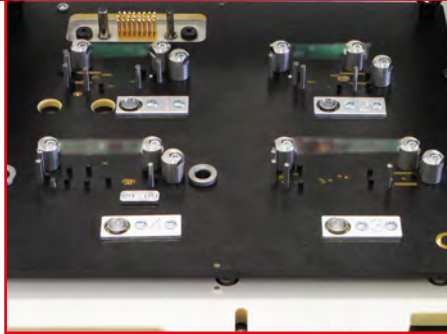
- Two autonomous desktop stations with nine copy slots and a master frame allow it to copy up to 36 hard drives simultaneously
- Asynchronous recording of different sources (master drives) is possible
- Various copy modes make it possible to mirror unchanged drives or to duplicate partial data packages via an intelligent copying process
- Data transfer speed up to 24 GB / minute
- Contacting of the hard drives is performed via the original cable, activation by an eccentric lever
- The type to be created is selected via bar code, which will be checked during scanning
- Correct allocation of the hard drives is ensured by a manual bar code reader and position sensors
- Desktop stations remain completely locked until the end of the programming operation
- Each desktop station is controlled via the MCD Toolmonitors Telnet, Visu, SerIO and the measurement software TestManager CE

Application Examples

- Recording of infotainment systems
- Duplication of basic configurations, e.g. of PCs in large quantities
- Reproduction of security backups or software
- Creation of backups
- Secure data deletion and migration
- Fast and safe realisation of hard drive upgrades
- and much more



Adapter with Touch Screen Monitor



Marks and LEDs inside the Adapter



Example for Utilization of LED Curing Lights from Dental Technology





The test system tests up to four circuit boards which are used in LED curing lights from dental technology. The fixture with a mobile ULC rack allows a short handling period by inserting and testing the four PCBs simultaneously.

Marks inside the fixture thereby enable a quick and simple allocation and control function of the LED control PCBs.

Features

- Full automatical testing for current and voltage values at different electronic loads
- Testing of LED power source with 2x470 nm and 1x410 nm
- Additional examination of subsequent operating functions of the „controller“ PCB
- Functional test of activation function for control LED, buzzer and push buttons
- Confirmation of requested functions manually via touch screen monitor or barcode scanner
- Failed test results are displayed, individually stored and protected
- Every single failure can be assigned to the corresponding test point, overwriting of measurement data during multiple measurements is avoided
- Maximum of four PCBs can be inserted in a fixture

Equipment Components

- Control unit MIO1616
- Multimeter
- Touch screen monitor
- Measurement software TestManager CE
- Mobile ULC rack

Application Examples

- Functional testing of components
- Voltage and current measurement at PCBs
- Stimulation of LED, buzzer and push button contacts
- Connector test
- and much more



Open FCT Adapter



FCT Adapter with Emergency Stop



3D Production Model with
DUT Mounting Fixture





This programming and testing device was developed in shape of a functional tester (FCT) for a well-known German manufacturer of innovative water and heating pumps. The pump memorizes via a sensor at the forward pipe, when hot water is requested from the consumer and provides it proactive and punctually.

To check the drive behind the electronics of these intelligent domestic water pumps, this test system was now developed to enable the manual contacting and automatic functional test of a stator board. For this process an isolating transformer provides 230 VAC for the DUT. In order to ensure the safety an adapter lock and an emergency switch have been integrated.

Features

- Programming of the microcontrollers
- Functional testing of stator boards
- Measurement data acquisition in SQL database
- Machine self test with a dummy DUT
- Mechanical marking of IO parts
- Expanding the updated interface of the MCD TestManager also during the test
- Verification of NTC resistor (thermistor) by resistance measurement and calculation of the target value from the adapter temperature
- Measuring the resistance of the windings (4-wire measurement)
- Measuring the current consumption
- Measuring of motor voltages
- Checking of the power supply function

Equipment Components

- 19" rack
- Keysight power supply and multimeter
- Touch screen monitor
- UPS emergency stop and adapter lock
- Manual testing adapter
- Isolation transformer for 230 VAC treatment of the DUT
- Programming device ICP2
- Measurement software TestManager CE



Open Adaption of the Programming and Test Systems



Spectrum Analyzer during Process of Testing WiFi and ZigBee Signals



Shielded RF hood for Functional Testing of Signals





Modern heating systems of a “smart home” communicate e.g. with a user’s smartphone and send disorder warnings directly to the manufacturer. In order to establish this communication channel, circuit boards are required that are able to generate WiFi or ZigBee signals and simultaneously exchange information via CAN.

For programming and testing of PCBs with a lot of single processes and signals, this adapted programming and test station was developed. Especially the short test time of less than one minute was important. Also the adjustment of frequency and output power of the radio signals according to the legal specifications was implemented. Both systems are linked by a database for process control. This enables additional saving of time and effort during ongoing production.

Features

1. Programming Station

- Fully automatic programming of up to 4 DUTs
- Programming takes place in 3 blocks in parallel or separately for each DUT
- Programming time for 4 PCBs: 30 seconds
- Incorrect insertion of a DUT is avoided by means of various guide pins and holders as well as visual illustrations
- Continuous monitoring of the test process via MCD measurement software TestManager CE

2. Functional Tester

- Safety measurement of WiFi and ZigBee signals via a shielded RF hood
- Contactless testing and frequency adjustment
- Functional test of information exchange
- Voltage measurements
- Programming of user-specific information like password and WiFi-ID
- The adapter with the DUTs receives all test signals only via one main connector
- Printing of QR and barcode labels to enable an instant start-up of the heater
- Termination of the testing process via MCD TestManager CE and Toolmonitor Data Manager

Equipment Components

- 2 x 19" rack and fitting adapter
- 2 x measurement software TestManager CE
- 2 x Toolmonitor Data Manager
- Toolmonitor Serialline
- Control unit MIO1616
- USB hub 2.0 6-Port with two control inputs
- Spectrum and signal analyzer
- Raspberry Pi
- Emergency switch on the front side

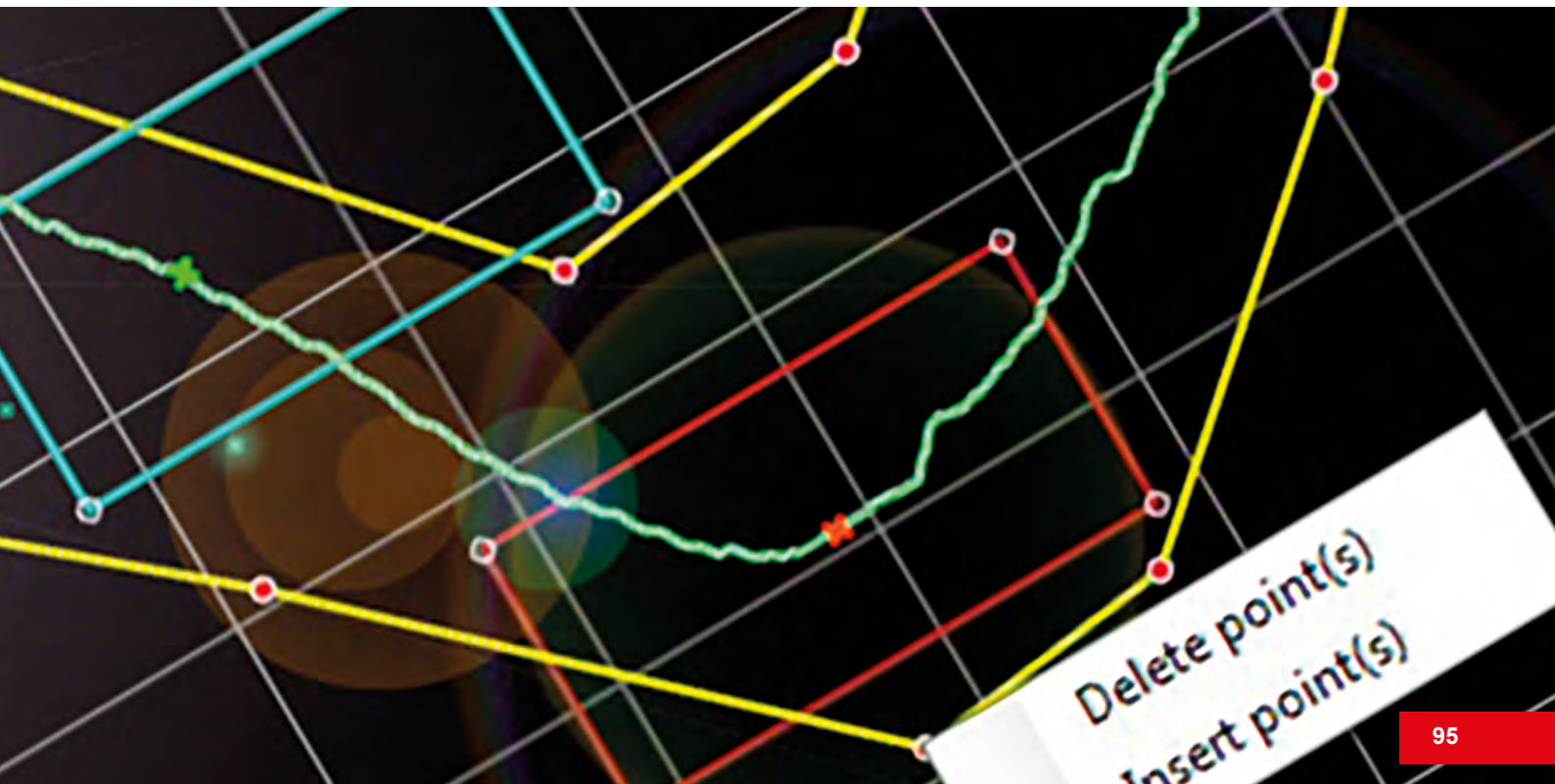


MCD Product Lines

SOFTLINE	- Software	Page 94
MODLINE	- Modular Systems	134
CONLINE	- Control Systems	144
BOARDLINE	- Boards	164
AVIDLINE	- Audio / Video	174
PIXLINE	- Imaging	184

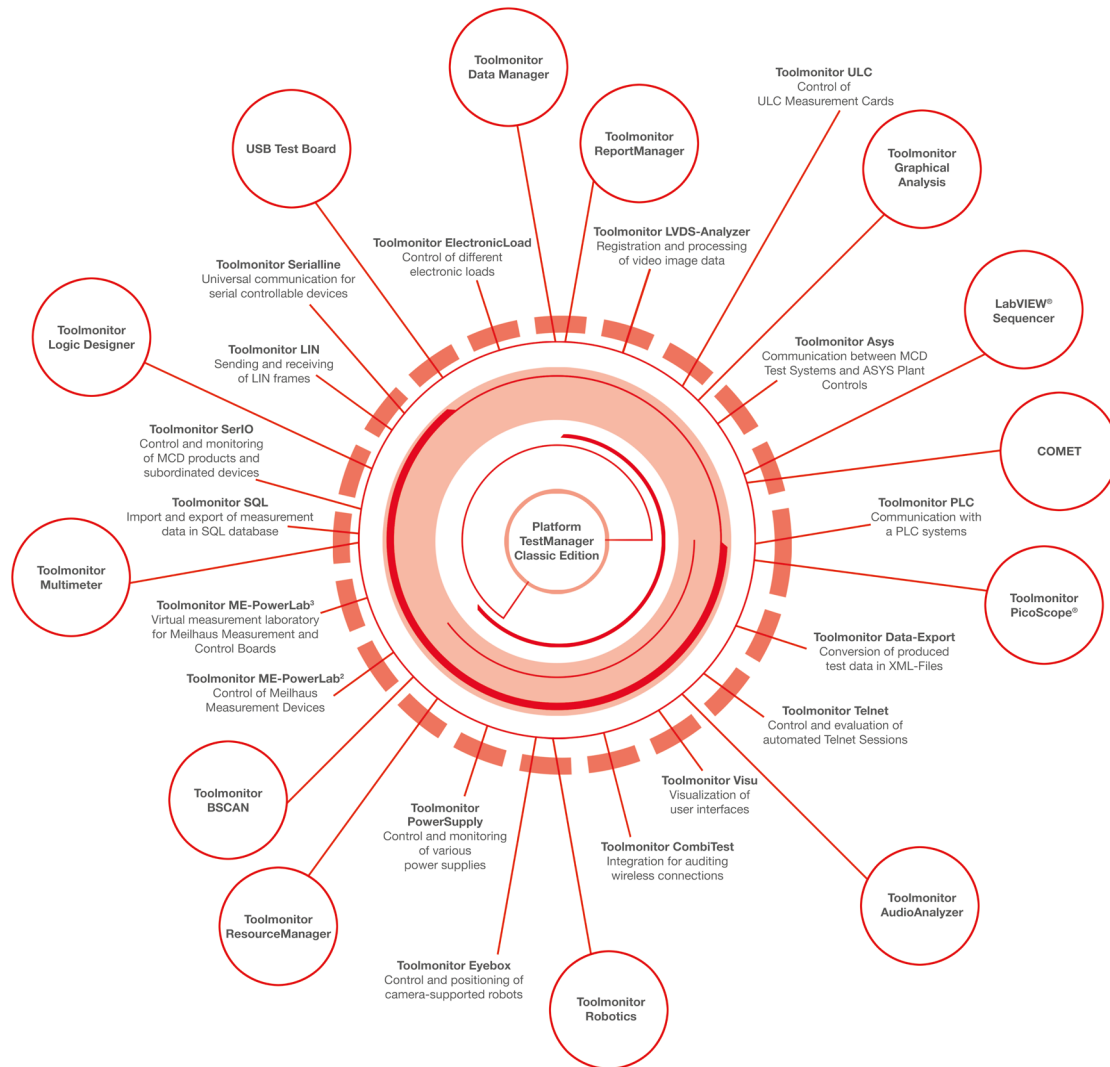
MCD's comfortable software solutions enable the user efficient collection and analysis of specific data. Particularly in the areas of audio and video analysis, they are usually the better and inexpensive solution to expensive hardware.







Overview of SOFTLINE Toolmonitors	Page 98
TestManager Classic Edition	100
COMET	104
USB Test Board	106
Toolmonitor PicoScope®	108
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Overview of all Toolmonitors that are contained in the product line SOFTLINE



MCD Elektronik offers the user a variety of comfortable software solutions. Whether universal interface communication, management and control of hardware components or visualizing of measurement results - the Toolmonitors of the SOFTLINE offer the right solution.

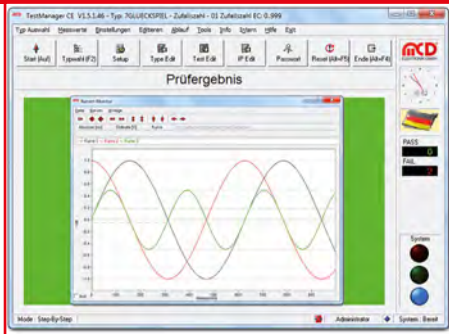
The focus of these software components is the Test-Manager CE. This development kit enables integration of all Toolmonitors, so that an individual user interface can be provided to the user.

The presentation and interpretation of measurement results, communication with connected devices and the data output is simple, fast and inexpensive.

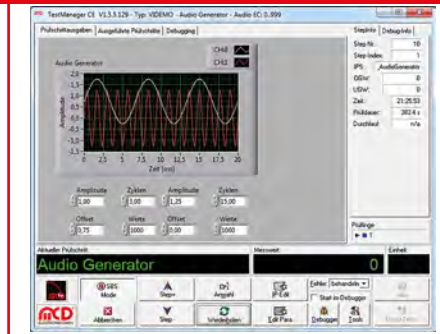
The following pages present the most important Toolmonitors and the TestManager CE in detail. Information of all software solutions can also be found on the company's website:

www.mcd-elektronik.com/products/softline

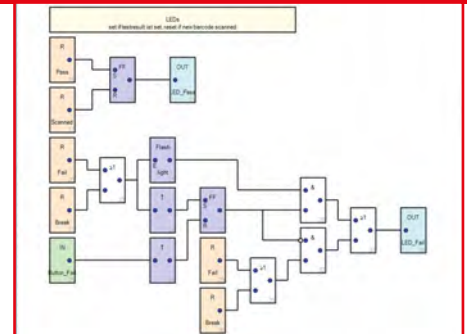
shop.mcd-elektronik.com/Softline



MCD TestManager Display



TestManager CE with an embedded LabView® Front Panel



Graphical Programming for Mechanical Controls





The TestManager is the universal standard software for application-specific measurement and test stations in the automotive and electronic industries. It is simple, modularly scalable, inexpensive and efficient.

The TestManager is a software development kit for the creation of applications for test systems. The areas of application are screening systems, board testing, final inspection and process control.

It also includes a variety of interfaces (IEEE-488, RS232, TCP/IP, CAN, LIN...). In addition, the program offers an interpreter with connections to DLLs, COM, ActiveX, .NET assemblies. Of course, the MCD TestManager is expandable for customer-specific requirements and therefore always adapts on the individual needs of the customer.

Essential features are a designable graphic user interface, a variety of software and hardware interfaces with extensive test monitors and a powerful interpreter, with direct integration of external DLLs, COM +/ActiveX-.NET - and LabView® - components. LabView® VI's can be integrated in the runtime or development environment. This allows TestManager to be utilized as a sequencer for the Labview® VI's. Integration takes place via the interpreter of the TestManager or simply through configuration as a component of the test sequence.

Among the software interfaces are TCP/IP, database and web interfaces. The self-explanatory MCD interpreter language is just as easily programmable as in C#, VB and Java #, without an additional development environment. With the assistance of the type-management, test procedures for various sorts of devices and structures are summarized.

Through variant creation, existing operations can be modified without requiring them to be recreated. The selection and charging processes of the sample to be tested during operation can be done automatically.

Integrated Toolmonitors are available to provide assistance during the program development cycle as well as the commissioning or troubleshooting phases. The representation of layout data and test-point coordinates, the breakdown of all communication protocols (e.g. CAN, LIN, MOST, RS232,...), the display and modification of existing switching conditions, or the signal tracking using voltage and current measurement, signal analysis, or via oscilloscopes are various examples of what can be done. In addition, an integrated debugger can view and control the test process step by step. Multiple instances of the TestManager can be intelligently managed and controlled.

Critical for the analyses to be performed are the test procedures themselves. Individual sub-tasks for the units are divided into separate test steps and then processed sequentially.

The individual test steps are then created by the application developer within the TestManager. Specific methods or modes are provided in case complex functions occur.

This is especially relevant for access to connected hardware and also for linkages to external components, such as databases or the process-control engineering. By integrating .Net Frameworks and additional programming languages, the application developer has access to an almost endless number of pre-built components and tools that can be integrated into the test sequence. These components can enhance the visualization, the data exchange on the intranet, complex calculations or the integration of external components. With the help of the constructed test steps, the application developer ultimately generates a flow chart for the entire analysis. In conjunction with the sequential control of the TestManager, both individual testing as well as parallel testing of multiple samples are realized.

Hardware

For data acquisition, standard measurement systems from the MCD Universal Measurement System (MCD UMS) family are used. Different modules in Euro-format, such as digital and analog converters, multiplexers, frequency generators and counters, and many others can find their use in the MCD UMS. The system can be configured according to the desired requirements of the inspection task.

External instruments can be controlled serially or via IEEE-488, Ethernet, Serial or USB. With dissimilar adaptations and the above-described software concept, various tests can be performed with this system. This allows both the use and development of prototype and small batch production as well as for series production.

Student Version

The TestManager Classic Edition is also available in student edition:

- For school and training, not for commercial use
- Limited features
- Unlimited license period with PC-bound software key

Textbook

The TestManager CE textbook with hands-on exercises is also available, providing step by step instructions.

Read our textbook now online:

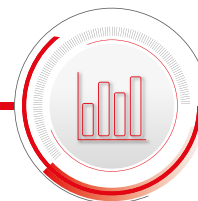
https://issuu.com/mcdelektronik/docs/testmanager_eng



TestManager CE Training

For more information, see page 190 / 191.

Demo Version for Download
www.mcd-elektronik.com/tmce



Technical Details

Software platforms

- .NET (C#, VB, J#)
- MCD Interpreter
- NI LabView®, VI's implementable
 - Synchronous or asynchronous request
 - Exchange of process and measurement data
 - Unlimited hardware access
 - Front panels independently represented or embedded in TestManager
 - Direct exchange between runtime and environment of development

.NET Integration

- Integration of Microsoft® .NET-Framework
- Direct embedded of C#, VisualBasic and VisualJava for .NET Sourcecode and components
- Dynamic translation and the creation of assemblies without additional application development system

.NET / Web Server

- Web interface for remote monitoring and remote control in your intranet
- By the use of the integrated web server no additional components are needed
- User-friendly monitoring layouts in your internet browser
- Integrated reports and report designer

Application Examples

- Inline test systems
- Automatic adjustment
- Automatic test system
- Screening equipment
- Endurance, board and final testing
- Universal test and measurement systems
- Qualification test systems
- Repair stations
- Process controll
- Analysis stations
- Laboratory and measuring stations
- Automation of processes
- TestSequencer for LabView® VI's

Order Information

License fee for TestManager Classic Edition

Order number	117139
Price	819,00 EUR

Student Version TestManager Classic Edition

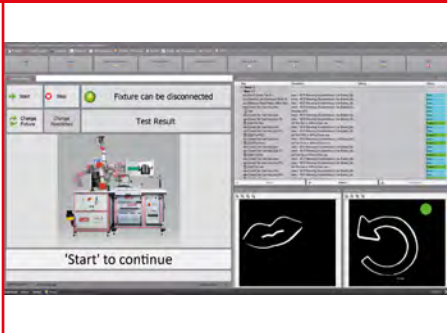
Order number	117724
Price	39,00 EUR

License fee for TestManager Classic Edition USB Dongle

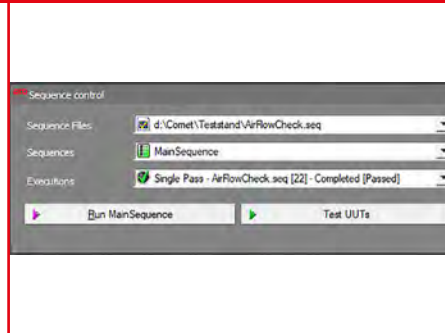
Order number	121785
Price	900,00 EUR

Software Textbook TestManager CE

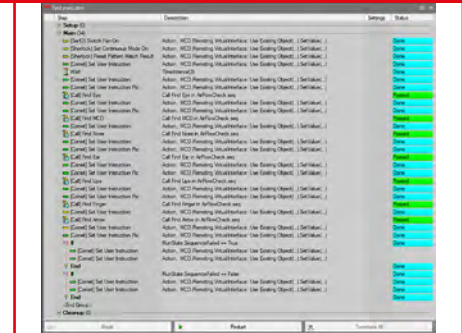
Order number	118006
Price	19,99 EUR



Optic Test Sequence with
“VTS 2030” Test System



Selection and Integration
of TestStand® Sequences



Test Process





The extensive software application MCD COMET is used for development and execution of user-specific test and measurement applications. It connects MCD software and hardware products with the sequencer tool TestStand® from the measurement and test technology manufacturer National Instruments®.

Thus, COMET is a strong interface for forward-looking applications because the performing of test and measurement processes happens via intuitive user interfaces by integration of all MCD Toolmonitors. The user interfaces are modern and flexible as well as easy to handle.

Besides the predefined, graphical user interfaces for selecting and controlling of the TestStand® sequences, user-specific interfaces can be created. Therefore, a variety of graphical operating elements is available.

Provided surfaces, functions and interfaces are integrated from TestStand® and contained inside the self-created user interfaces. The range of functions can be started in endurance or single pass mode with only a few clicks and is expandable via extern DLLs and third-party software.

New functions can be additionally programmed via C#. The range of functions is moreover arbitrarily scalable through an integration of MCD tools. Usable functions are for example:

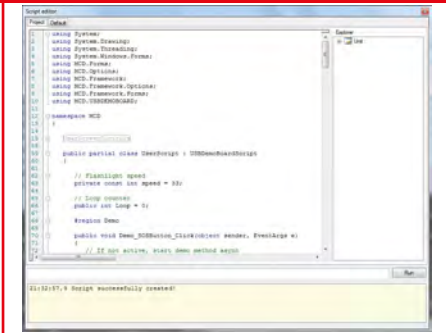
- Order and type management
- Support of various communication protocols (e.g. TCP/IP, UDP, RS232, LIN, CAN)
- Comfortable saving of measurement data into SQL databases
- Efficient control of PLC systems
- Automated process monitoring
- Comfortable and simple control of various hardware components from well-known manufacturers
- Imaging and image analysis
- Audio and video measurements as well as signal analysis
- Boundary Scan tests
- Control of roboter arms

Order Information

License fee for MCD COMET

Order number 156480

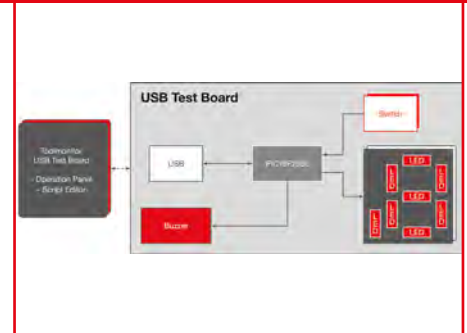
Price 990,00 EUR



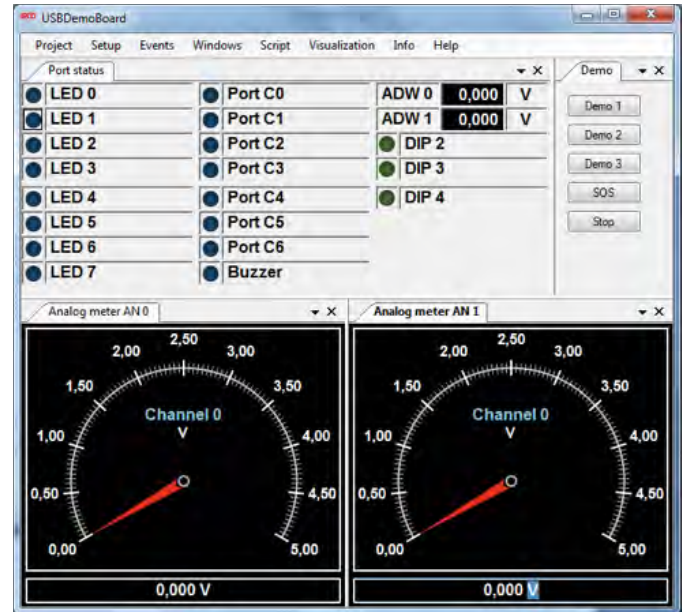
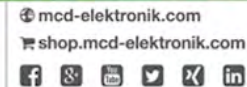
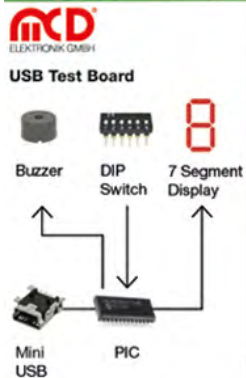
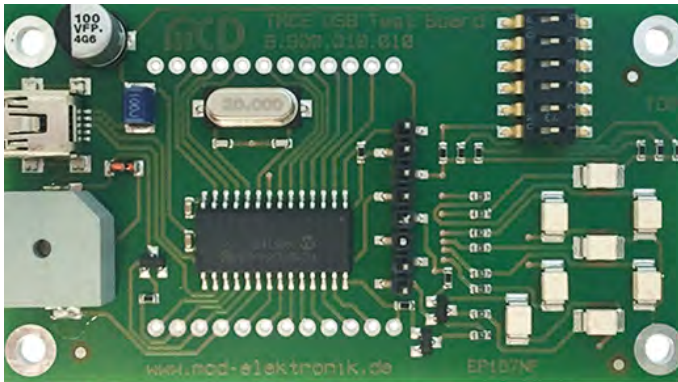
Script Editor



USB Test Board with MCD Products



System Architecture



Link to
Video



The MCD USB Test Board has a segment display, 6 switches for setting options and a buzzer for triggering audio signals.

USB Test Board with

- Microchip PIC18F2550 Microprocessor
- 8 LEDs
- Buzzer
- 6 individual adjustable switches
- USB interface
- Individual expendability when adding additional hardware
- Analog / Digital Ports adjustable via Toolmonitor

Toolmonitor with

- Operation panel for controlling the LEDs and the Buzzers
- Display of the switch position and analog inputs
- Script editor to drive the LEDs and the buzzer in their own processing scripts
- Creating your own user interface for visualization and control of the MCD Demo Board

TestManager Application with

- Exemplary integration of the MCD Demo Boards in their own test sequences

Switch Settings

With the switches, it is possible to switch back between remote and local operation. Existing commands can be selected on the board by different switch settings during local operation.

- *Switch 6 off:*
Control of Toolmonitor via USB
- *Switch 6 and Switch 1 on:*
Successive flashing of all LEDs
- *Switch 6 and Switch 1 and 2 on:*
Successive flashing of all LEDs, followed by two short sounds of the buzzer

Order Information

USB Test Board incl. 4GB memory card in a practical magnet box

Order number 120735

Price 25,00 EUR



More examples and demo projects:

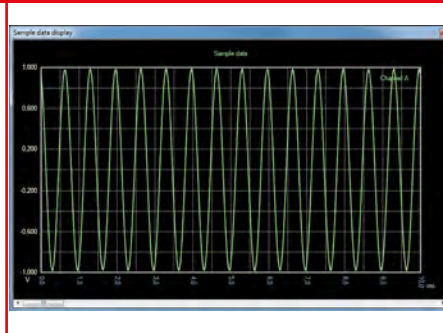
🔗 www.mcd-elektronik.com/demoboard

Requiring of the USB Test Board through:

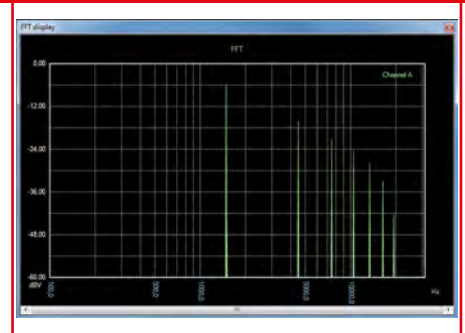
🛒 shop.mcd-elektronik.com/Softline/USB-Demo-Board.html



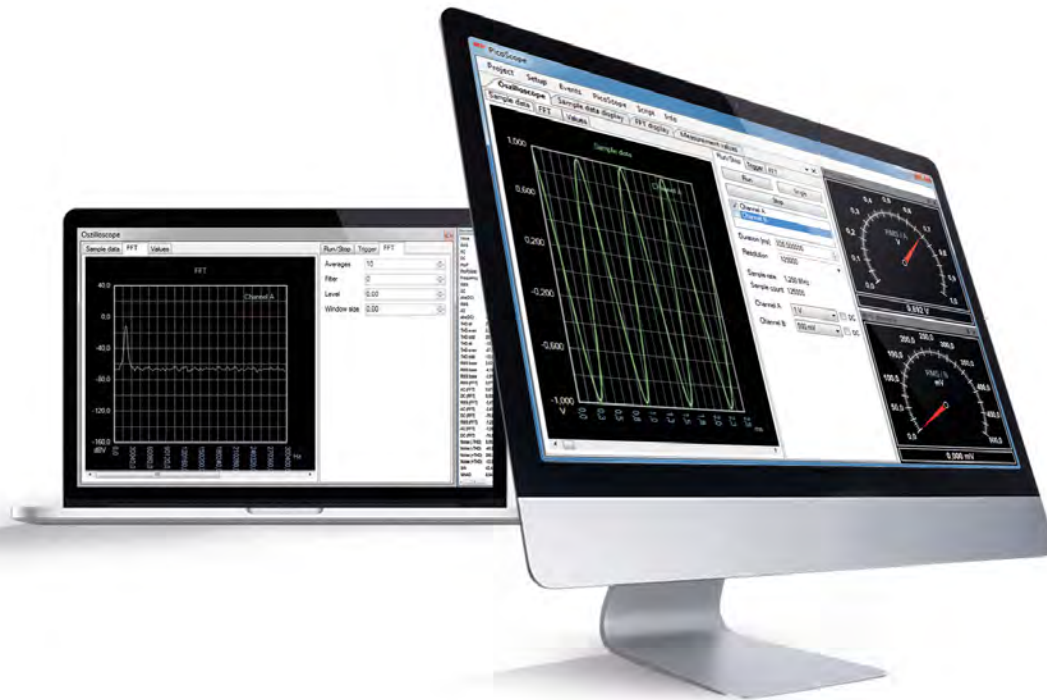
Filter Configuration and Display



Time Domain



Frequency Range





This tool allows you to easily monitor and control the operation of the 3000 and 4000 series PicoScope® Oscilloscopes.

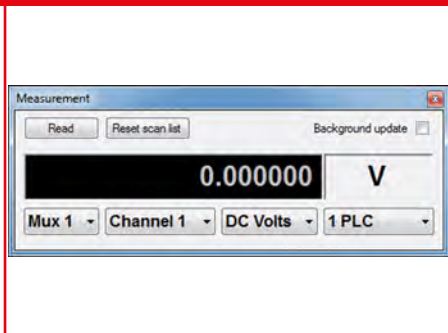
It offers the possibility to select the channels to be measured, the measuring range, the measurement duration and resolution. Likewise, the trigger conditions are set. The display can be shown in graphic, digital or analog form. The graphical display can be shown in both time and frequency domain (FFT analysis). A variety of measurements can be called upon in a tabular list. Powerful digital filters can be activated for signal processing.

The program interface can be made widely available and adaptable to the user requirements. Once created, configurations can be saved in project files and called upon when needed. With the help of an integrated script engine, all measurements and adjustments are performed automatically. For third-party software, the Toolmonitor can be fully remote controlled.

COM/DCOM or .Net-Assembly is used as an interface. This allows the Toolmonitor to be integrated in a large number of applications (Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), Open Office®, LabView®, MCD TestManager CE).

Order Information

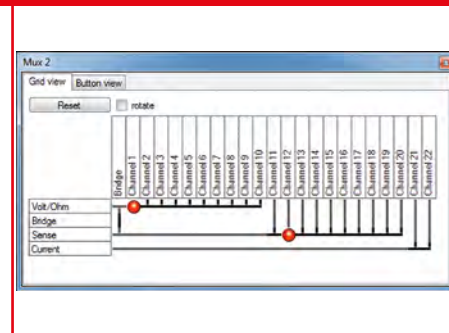
License fee for Toolmonitor PicoScope®	
Order number	118948
Price	195,00 EUR



Selection Channel, Measuring Size, Resolution



Analog Display



Multiplexer





This Toolmonitor allows you to easily monitor and control operation of diverse Multimeters.

It offers the possibility of selection of the measuring channel including multiplexers, the measured size and resolution. The display can be in digital or analog form. The multiplexer can independently measure signal distribution. The program interface can be made widely available and adaptable to the user requirements. Once created, configurations can be saved in project files and called upon when needed. With the help of an integrated script engine, all measurements and adjustments are performed automatically. For third-party software, the Toolmonitor can be fully remote controlled.

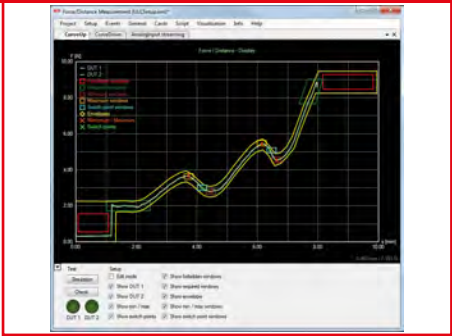
COM/DCOM or .Net-Assembly is used as an interface. This allows the Toolmonitor to be integrated in a large number of applications (Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), Open Office®, LabView®, MCD TestManager CE).

Order Information

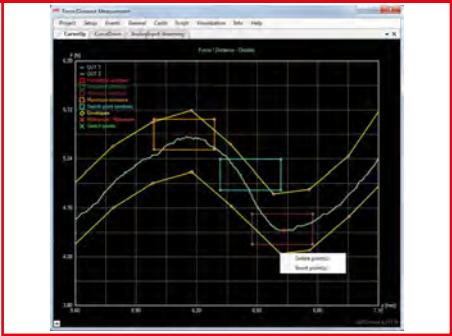
License fee for Toolmonitor Multimeter

Order number 118949

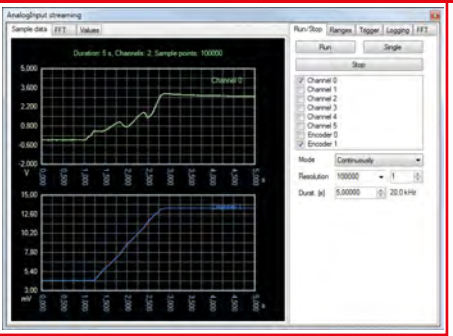
Price 195,00 EUR



Setup



Edit Mode



Analog Input





The Toolmonitor for the force/displacement measurement is a universal and flexible way to analyze force/displacement characteristic curves which are required for e.g. on the switch test.

For the analysis, the path is recorded via an encoder, the torque or the pressing force is recorded via a force sensor and the switching points are recorded via the test item. These signals are displayed depending on their course and if required can be substantially analyzed. The position of the switching points is controlled and extreme values are determined. The components used, amongst others include filters, window functions and failure lines.

The required window areas and failure lines can be edited using a graphic designer. Any number of windows and failure lines can be defined. The failure lines can be generated automatically by means of the software from so-called „golden devices“ and can be edited later if necessary. The analysis of the recorded signals and measured values can be exported in various formats. All recorded signals and measured values can be exported in various formats.

The program interface can be freely designed and widely adapted to user requirements. Once the configurations have been created they can be stored in the project file and loaded when needed. Using an integrated script engine all measurements and settings can be automated. Via third-party software, the Toolmonitor can be completely operated remotely.

Order Information

License fee for Toolmonitor Graphical Analysis	
Order number	121001
Price	445,00 EUR



Chronological Test Sequence



Block Processing



Display Options





For the MCD Test Systems a precise examination, an optimized testing time and economic resource costs are of top priority. To combine this, a new intelligent resource sharing software has been implemented with the Toolmonitor ResourceManager.

This Toolmonitor, which is shared by all test positions, administers the test procedures and gives „permission“ in blocks to run test. Time-consuming test sequences e.g. RF Generator, WiFi or on-board programming, in which a parallel processing of the individual position is possible, can be managed by the so-called ResourceManager. If a certain hardware is occupied it will try also to test in this hardware configuration, or -if possible- work off another block.

Thus, the test time is reduced to a minimum without much hardware effort. This handling is independent of the version that is being tested, even across PC's. In combination with TestManager, ResourceManager serves to control the process control system for test systems, through which multiplex devices will be tested simultaneously and asynchronously while using the existing hardware for the respective measurement in a shared manner.

In summary, working with ResourceManager provides the following capabilities:

- Locking hardware used in a shared manner
- Optimization of the test process when test blocks will be performed using the hardware available
- Simultaneous and asynchronous testing of mutiple DUTs, also different types of devices
- Synchronization of the test processes

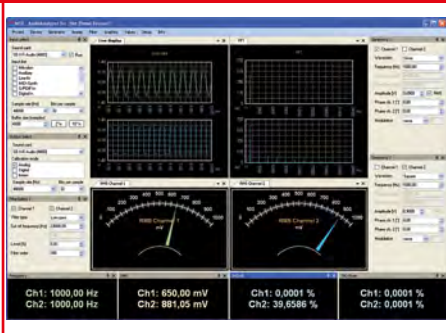
For third-party software, the Toolmonitor can be fully remote controlled. COM/DCOM or .Net-Assembly is used as an interface. This allows the Toolmonitor to be integrated in a large number of applications (Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), Open Office®, LabView®, MCD TestManager CE).

Order Information

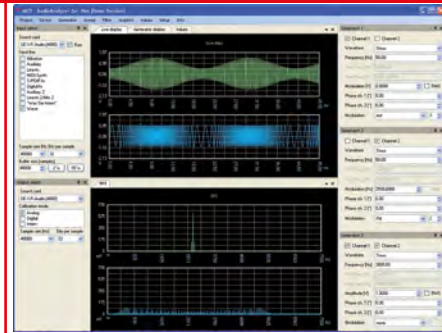
License fee for Toolmonitor ResourceManager

Order number 150039

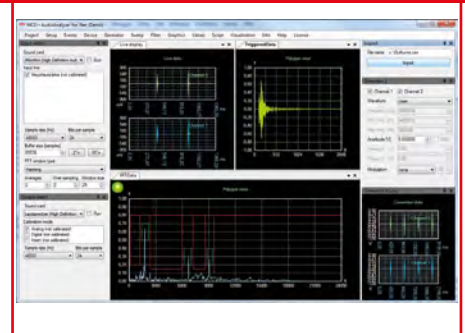
Price 500,00 EUR



Distortion Factor Measurement



Modulation and FFT Analysis



Testing the Clicking Sound of a Flasher Relay





The AudioAnalyzer is a software-based solution to analyze and generate analog and digital signals in the audio field. The audio signals are recorded on a sound card and made available to the AudioAnalyzer in digital form. Generated signals will be put out again.

The MCD AudioAnalyzer is coupled to the computer system via USB interface. The input range extends from 10 mVrms to 50 Vrms. The generator is controllable in the range up to 15 Vrms. Besides the use of the AudioAnalyzer as a stand-alone application it is also possible to remotely control or query all the functions and values of other Windows programs. For this purpose a COM Client/Server interface is used.

For the analysis of audio signals, in addition to frequency and various signal strength measurements, measurements of THD and FFT spectrum are possible. Through the integrated signal generators, different wave and modulation forms are generated.

The surface of the Toolmonitor AudioAnalyzer can be widely adapted and adjusted to varying applications. All functions of the AudioAnalyzer can be controlled with the help of a COM Server interface with other Windows programs. The measured values obtained can be integrated well into the different programs. Special programming knowledge is not required. For input, both analog and digital signal sources are possible.

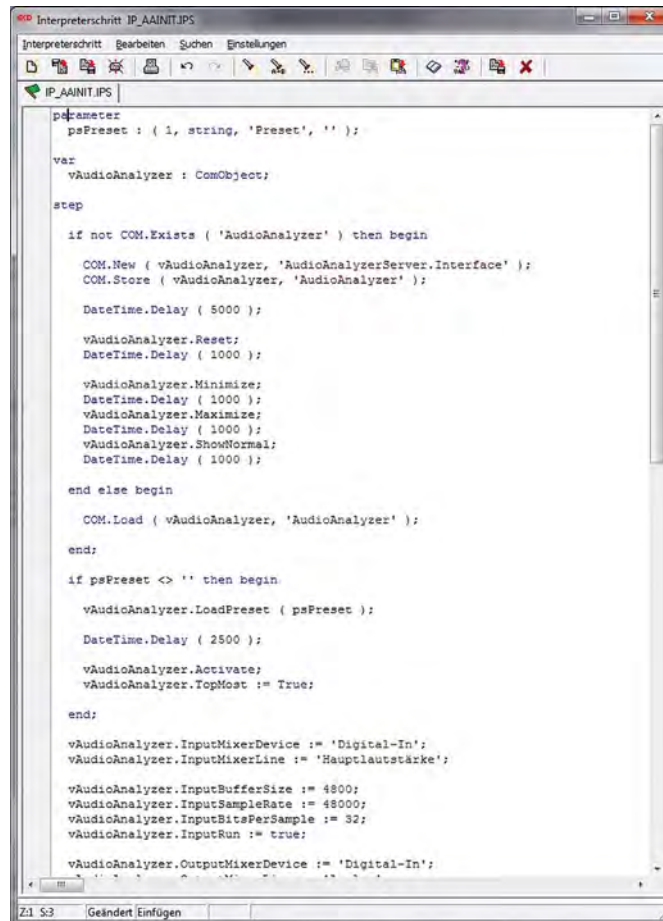
Using the TestManager CE, the automated AudioAnalyzer.NET can be controlled remotely.

Features / Characteristics

- Modern and user friendly interface
- Extremely flexible design of user interface
- Efficient FFT analysis
- Powerful generators (AM, FM, PM-Modulation)
- Easy to use filter
- Data import and export
- Support of multiple sound cards in a PC (internal and external)
- Extremely fast measurement functions for frequency response, phase transitions, and more.
- Access to all mixer settings
- Very high accuracy of the measurement calculation
- Comprehensive measurement functions such as amplitude, RMS, frequency, harmonic distortion, phase, etc.
- Automatic detection and reporting of frequency and phase response
- Typical measurement times of a frequency response 0-24 kHz at 200-300 ms
- Sweep functions
- Load and save all settings via project files
- Remote control of all foreign systems
- Analog, digital inputs can be selected via the sound card or MCD Analyzer

Programming Example

Located within the installation directory of the AudioAnalyzer.NET, which is listed in the TestManager CE directory, is a complete development environment for the TestManager CE Software with an exemplary procedure to control the AudioAnalyzers.



```

parameter
  psPreset : ( 1, string, 'Preset', '' );

var
  vAudioAnalyzer : ComObject;

step

  if not COM.Exists ( 'AudioAnalyzer' ) then begin

    COM.New ( vAudioAnalyzer, 'AudioAnalyzerServer.Interface' );
    COM.Store ( vAudioAnalyzer, 'AudioAnalyzer' );

    DateTime.Delay ( 5000 );

    vAudioAnalyzer.Reset;
    DateTime.Delay ( 1000 );

    vAudioAnalyzer.Minimize;
    DateTime.Delay ( 1000 );
    vAudioAnalyzer.Maximize;
    DateTime.Delay ( 1000 );
    vAudioAnalyzer.ShowNormal;
    DateTime.Delay ( 1000 );

  end else begin

    COM.Load ( vAudioAnalyzer, 'AudioAnalyzer' );

  end;

  if psPreset <> '' then begin

    vAudioAnalyzer.LoadPreset ( psPreset );

    DateTime.Delay ( 2500 );

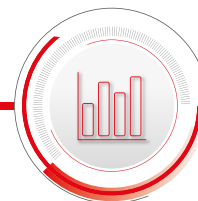
    vAudioAnalyzer.Activate;
    vAudioAnalyzer.TopMost := True;

  end;

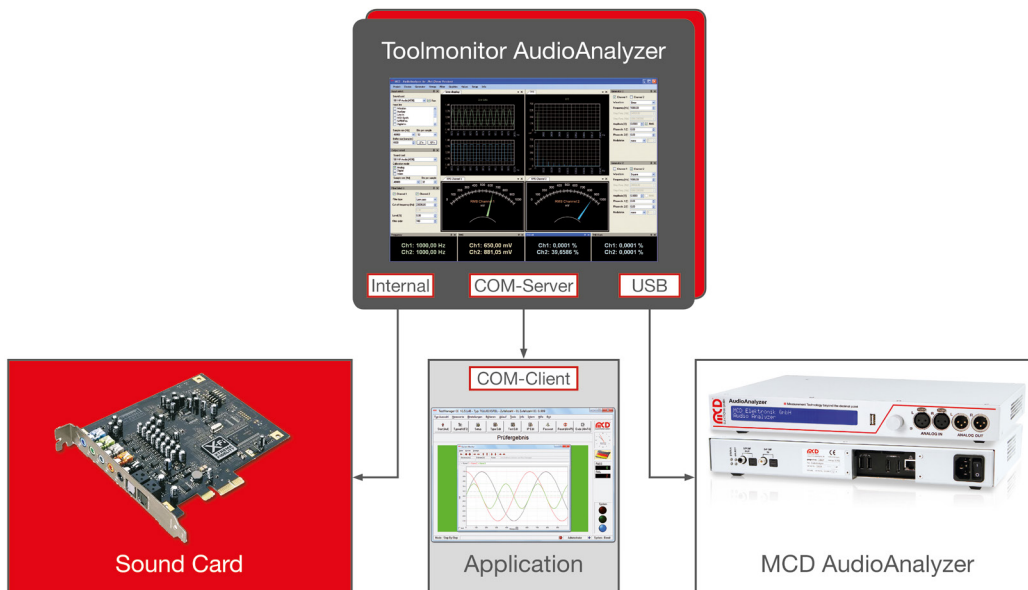
  vAudioAnalyzer.InputMixerDevice := 'Digital-In';
  vAudioAnalyzer.InputMixerLine := 'Hauptlautstärke';

  vAudioAnalyzer.InputBufferSize := 4800;
  vAudioAnalyzer.InputSampleRate := 48000;
  vAudioAnalyzer.InputBitsPerSample := 32;
  vAudioAnalyzer.InputRun := true;

  vAudioAnalyzer.OutputMixerDevice := 'Digital-In';
  
```



System Architecture



Input / Output

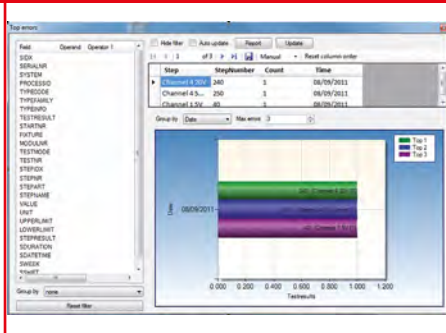
- Analog
- Digital
- Optical
- SPDIF

Functions

- Oscilloscope
- FFT spektrum
- RMS, THD
- FREQ, PtoP
- Generators

Order Information

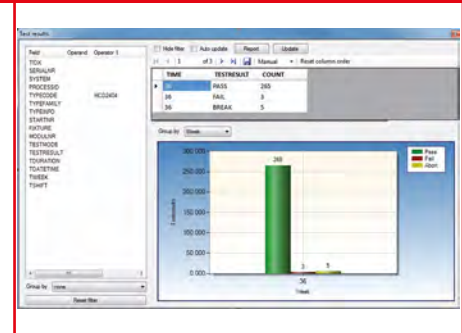
License fee for Toolmonitor AudioAnalyzer package	AudioAnalyzer (analog + digital), Desktop Version
Order number 2559SKLIZ	Order number 121374
Price 946,00 EUR	Price 1.680,00 EUR
AudioAnalyzer (analog + digital), Rack Version	AudioAnalyzer (analog + digital), integrated PC
Order number 121158	Order number 121372
Price 1.680,00 EUR	Price 2.499,00 EUR



Top Errors



Data Analysis



Work Station Statistic





The Toolmonitor Data Manager has been developed as an additional module for the TestManager CE Software. It provides a simple way to access and evaluate the measured values, which are generated in the test mode. The program can be operated self-sufficient to the MCD TestManager Classic Edition.

Statistics and reports can be updated manually or automatically. Extensive statistics and analysis functions are available to the user.

Through the use of a powerful and fast real-time database, measurement data and response time can be evaluated at high speed.

All measured values and test results can be accessed directly during the test operation. There are extensive filter functions to choose the measured data from.

The measured data can also be accessed using a SQL interface. This allows the creation of user-specific rather than standardized queries to be evaluated.

The main statistical evaluations are:

- Statistics of test results and the test duration
- Error statistics (usually the quickest/distribution)
- Statistics of the measured values (distribution/variance)
- Analysis of machine and process capability

Customer-specific evaluations can be added by the user.

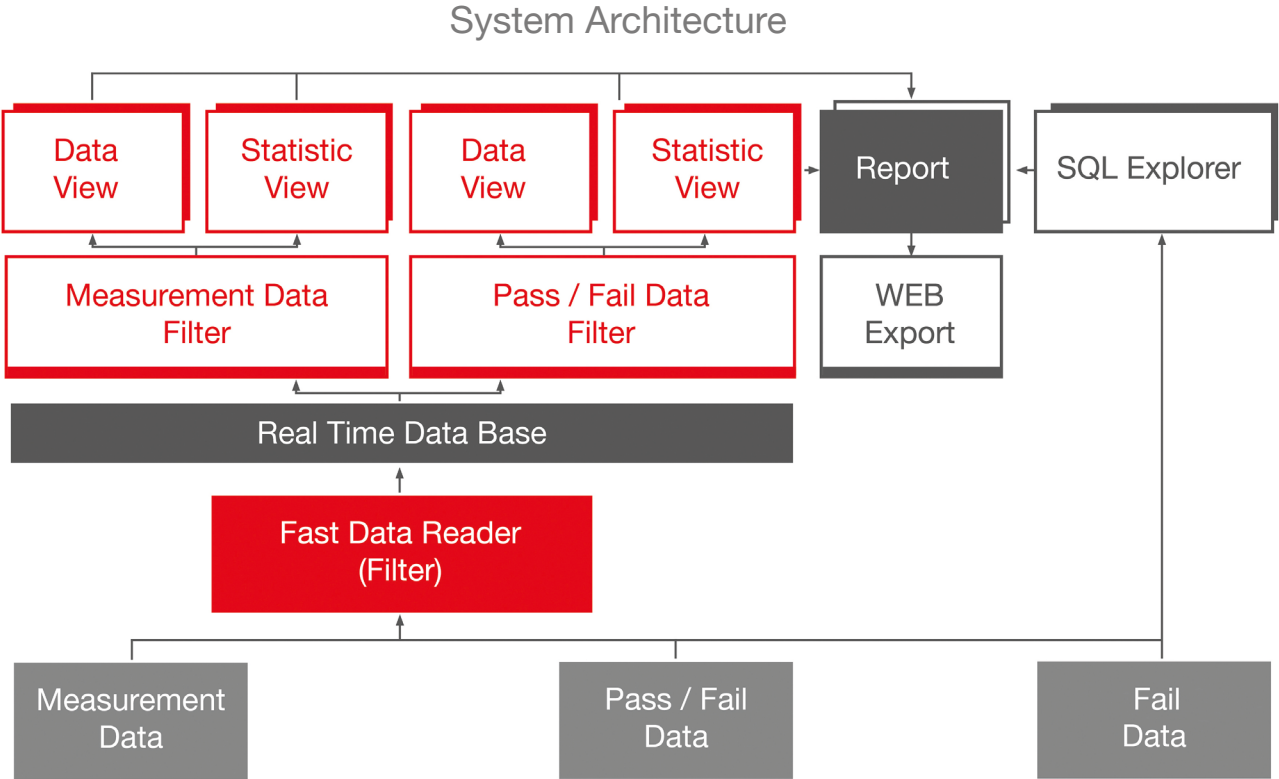
Once created, reports can be saved in project files and called upon when needed. The program interface can be made widely available and adaptable to the user requirements.

An integrated reporting module of predefined or freely configurable reports can be provided in all reports. These reports can be exported in a variety of formats (Word, Excel, PDF, Text, XML, HTML, etc.).

With the help of an integrated script engine, all evaluations and reports are automatically created and saved.

For third-party software, the Toolmonitor can be fully remote controlled. To supply measured data and statistics on the intranet, Toolmonitor Data Manager automatically updates and exports the info as WEB reports.





SOFTWARE

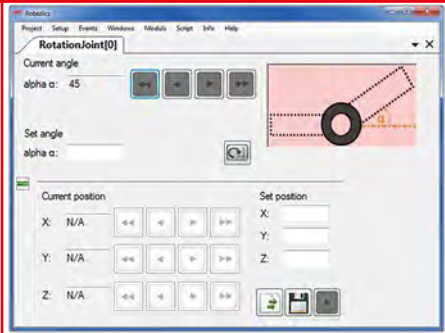
Order Information

License fee for Toolmonitor Data Manager

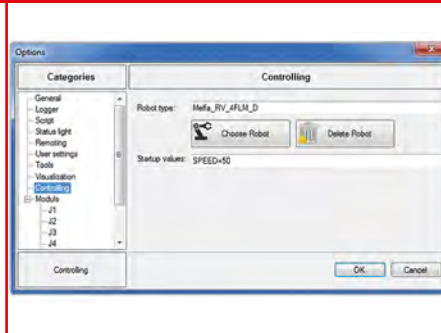
Order number 113148
Price 946,00 EUR

License fee for Toolmonitor Data Manager

USB-Dongle
Order number 151017
Price 1.010,00 EUR



Interface for Positioning of a Rotation Joint



Robot Setup with Speed Regulation



Usage of a Robot in a MCD Test System





The Toolmonitor Robotics supports and allows the controlling of various types of industrial robots within the electronic production.

Axis can be controlled manually, the robot position can be defined and special positions can be integrated. This process runs on so-called snapshots, which are running singularly or in sequences. The integration of several snapshots that are running one after another offers an efficient test process because the complex reload of the program memory is not necessary.

A gripper attached to the kinematic chain as an end unit is opened, closed and moved as defined through the axis by the Toolmonitor.

The following elements can be controlled by the Toolmonitor:

- Ball joints
- Rotation joints
- Torsion joints
- Linear joints
- Platforms and Grippers

For third-party software, the Toolmonitor can be fully remote controlled. COM/DCOM or .Net-Assembly is used as an interface.

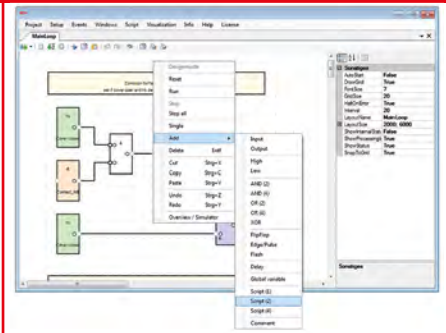
This allows the Toolmonitor Robotics to be integrated in a large number of applications (Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), Open Office®, LabView®, MCD TestManager CE).

Order Information

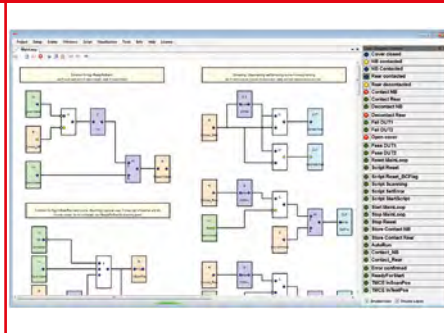
License fee for Toolmonitor Robotics

Order number 150225

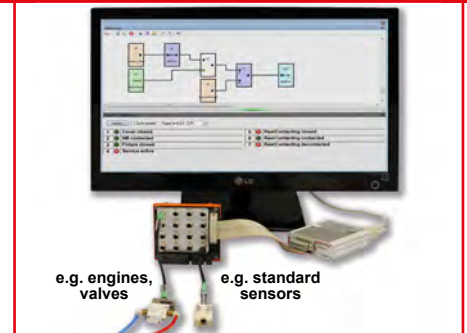
Price 946,00 EUR



User Interface Opened
in Design Mode



Exemplary Structure of
Several Logic Circuits



Exemplary Interaction of Toolmonitor
Logic Designer and MCD Devices





MCD's Logic Designer is a tool which is integrated into the MCD Toolmonitors to facilitate graphical programming. Logical connections are created and displayed with this Toolmonitor via so-called „logic modules“. A simulation of inputs and outputs is also possible.

These modules connect inputs and outputs of hardware components with variables, functions and events that are integrated via script engine. Hardware components could be MCD's mechanical control units MIO1616 and PIC8IO or the Sensor Actuator Box.

Basically, the user interface of the Toolmonitor Logic Designer includes two utilization modes, the design mode and the execution mode. The design mode is used for the creation of logical circuits, the execution mode is used for the testing of the circuits.

With the design mode, it is possible to use these logical modules and standard electronic circuits:

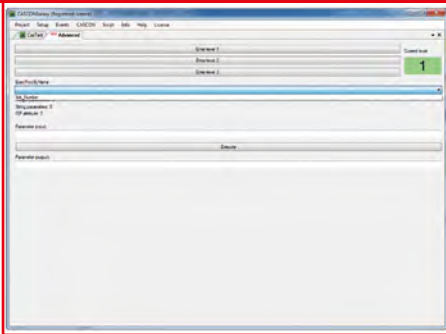
- INPUT and OUTPUT
- AND, OR and XOR
- Pulse-/Edge tags

- FlipFlop tags
- Global variables
- Flash modules
- Debounce modules
- Delay modules
- HIGH and LOW
- Script modules
- Comment elements

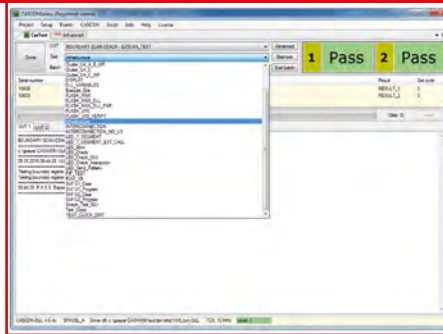
The logic modules „INPUT“, „OUTPUT“, „Global Variable“ and „Script“ allow a smooth integration of the created circuits to other MCD Toolmonitors, for example to Toolmonitor SerIO, via „Virtual Interface“. All modules can be variably configured. Beneath the specific configurations of the modules, commands such as positioning or description texts are generally available.

Order Information

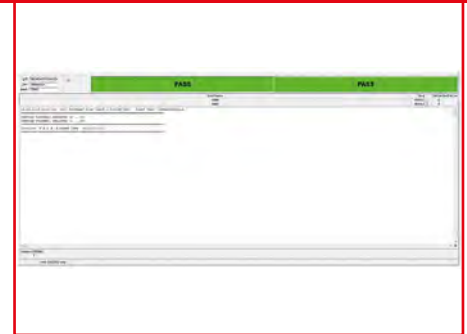
License fee for Toolmonitor Logic Designer	
Order number	150733
Price	195,00 EUR



Advanced User Functions for all of the CASCON™ Levels



Settings Range and Display of Test Procedures and Results



Presentation of Boundary Scan Tests





The Toolmonitor BSCAN allows a simple and user-friendly application of CASCON™ Galaxy driver libraries from Göpel Electronic. These libraries support the provision and evaluation of Boundary Scan tests with corresponding hardware components.

The following functions are provided by Toolmonitor BSCAN:

- Selection and launch of Boundary Scan tests
- Querying and displaying of test results
- Asynchronous and synchronous test procedure
- Parallel tests of several DUTs
- Execution of user-specific test functions
- Access to several test registers, pins and variables
- Access and displaying of additional I/O channels
- User-specific visualization and reporting
- Access to all driver functions of the CASCON™ Galaxy library

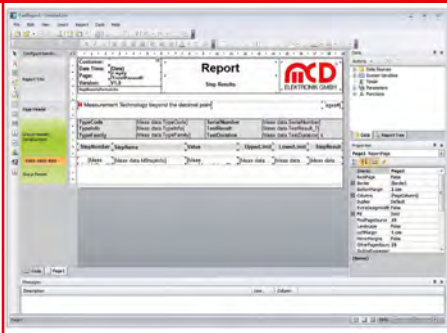
For third-party software, the Toolmonitor BSCAN can be fully remote controlled. COM/DCOM or .Net-Assembly is used as an interface. This allows the Toolmonitor to be integrated in a large number of applications (Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), Open Office®, LabView®, MCD TestManager CE).

Order Information

License fee for Toolmonitor BSCAN

Order number 121488

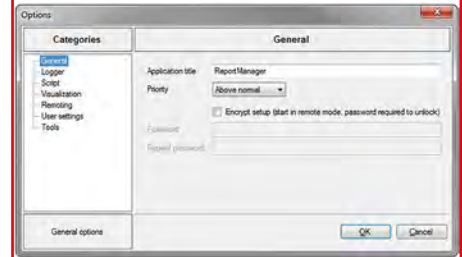
Price 845,00 EUR



FastReport Designer
for Report Creation



Selection of Layout Template



Setup





Toolmonitor ReportManager is used for the creation of report drafts and user-specific reports, which record measurement results after a test procedure of the TestManager CE. The Toolmonitor ReportManager is basically an extension of the TestManager CE.

After performing each test procedure, the TestManager CE transfers all test results and parameters to the Toolmonitor ReportManager automatically. The data can be directly accessed and retrieved, which gives the advantage that it is not necessary to use a database.

Subsequently, this data can be used for the creation of reports. Up to three different reports can be parallel defined and used at the same time.

Application areas:

- Reports of measurement data for the current DUT of a test procedure
- Product documentation
- Calibration protocols
- Product labels

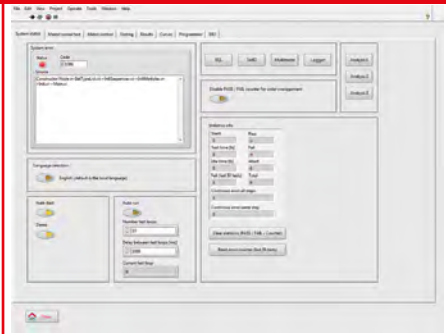
For third-party software, the Toolmonitor ReportManager can be fully remote controlled. COM/DCOM or .Net-Assembly is used as an interface. This allows the Toolmonitor to be integrated in a large number of applications (Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), Open Office®, LabView®, MCD TestManager CE).

Order Information

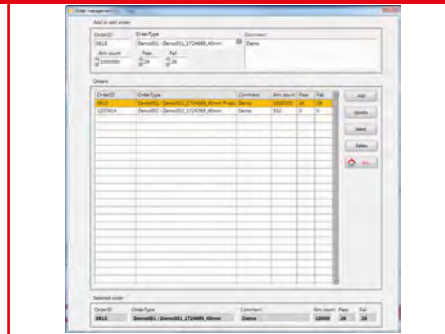
License fee for Toolmonitor ReportManager

Order number 122353

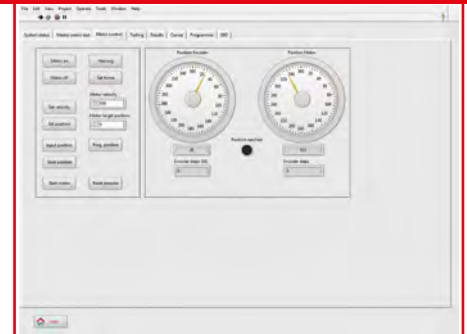
Price 225,00 EUR



Service Menu with Integrated MCD Toolmonitors



Order Management



Detailed System Information





MCD's LabVIEW® Sequencer is an extensive software tool for the creation of user-specific test processes. It simultaneously builds a connection between the products of MCD and the world of LabVIEW® from National Instruments, because all of the Toolmonitors are integrable to LabVIEW®'s software environments.

The software offers similar solutions as MCD's measurement software TestManager CE, but is based on the LabVIEW® programming systems.

An integrated test editor supports the development of random test steps with variable parameters. The interface is also created and preconfigured via LabVIEW® and offers a variety of valuable features. This particularly includes language switching, reporting about current measurement values and test results, a service menu for facilitation of troubleshooting and debugging as well as a function for cyclical reference component testing with pass/fail evaluation.

Created test steps can be simply programmed at so called „test cases“ inside the LabVIEW® environment. Already available LabVIEW® applications and VI's are integrated to the entire system as well. Test processes are structured, type families are summarized and existing procedures are modified by creating variants via the integrated type management.

Type selection of DUTs takes place automatically or manually via its also integrated order management. The integration of DLL's and other third-party software is also possible.

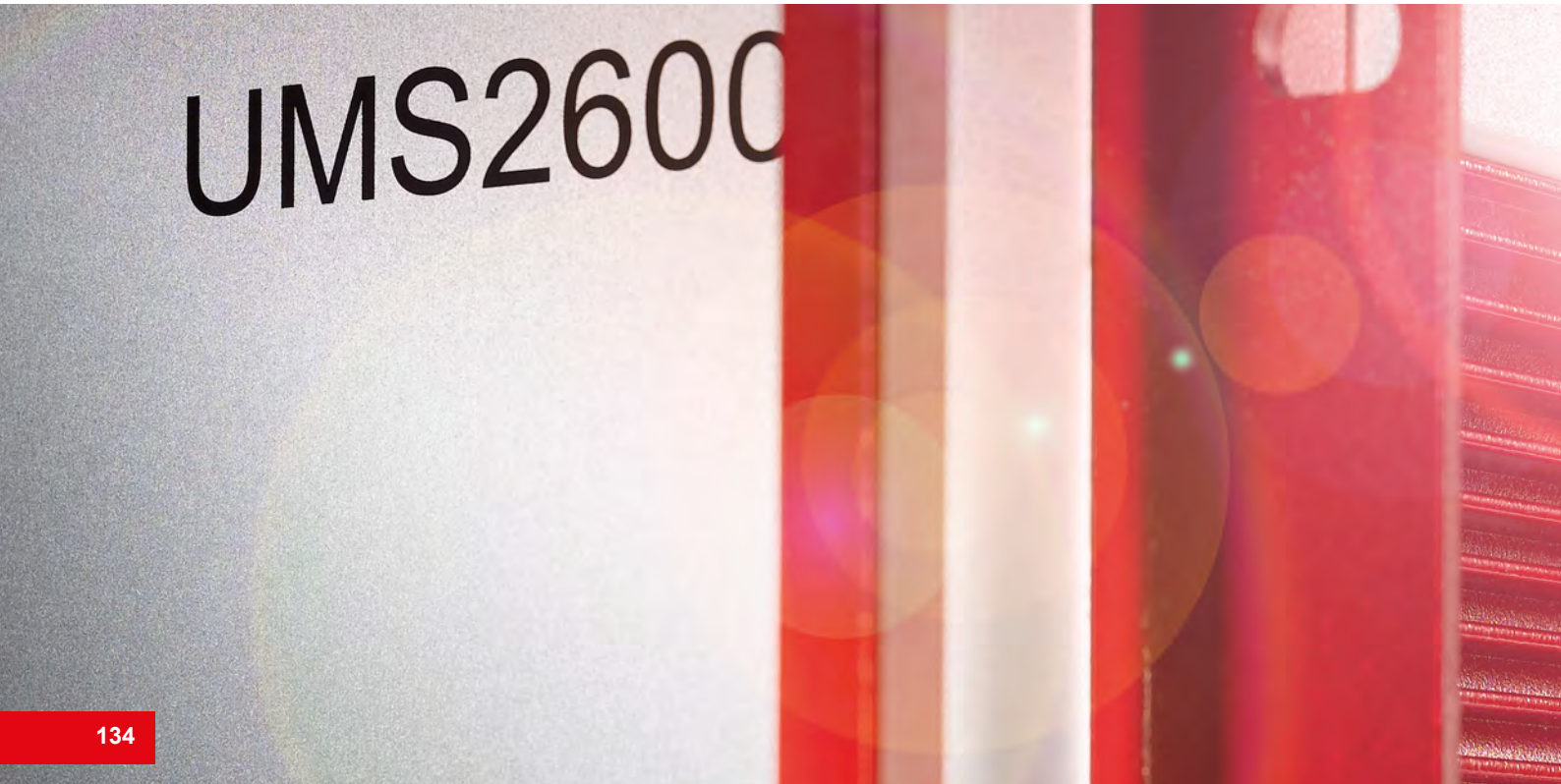
This offers for example comfortable integrations of SQL databases for measurement data storing or the usage as a module for process monitoring with MCD's Toolmonitor Data Manager. With this LabVIEW® Sequencer, these additional following features are available for the user:

- Fail repeats und jumps
- Access rights management for all functions
- Local statistics with variable subsequent fault detection and treatment
- Variant filters
- CSV export
- Parallelization of test processes via multiple instances

Order Information

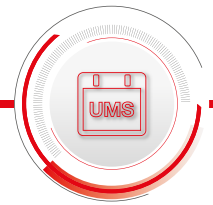
License fee for LabVIEW® Sequencer	
Order number	153528
Price	900,00 EUR

These universal, PC-controlled measuring systems, in addition to MCD's TestManager Classic Edition Software, provide a powerful measurement and control unit in 19" technology for complex test systems.



UMS2600

MODLINE - Modular Systems

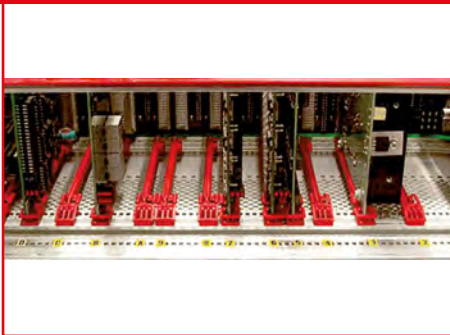


MODULAR SYSTEMS

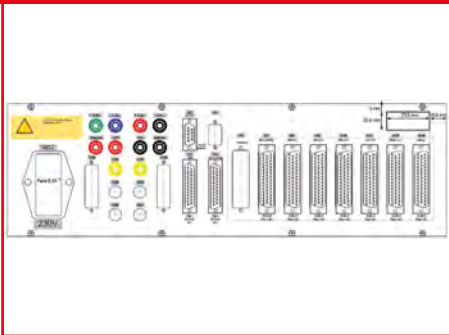




Universal Measurement System UMS1300	Page 138
Universal Measurement System UMS1300 ULC	140
Universal Measurement System UMS1300 ME	142



Module Slots

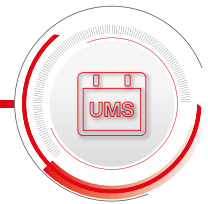


Scale Drawing



Rear Connections





The MCD Universal Measurement System UMS1300 is a PC-controlled modular test system in 19" technology with user-oriented equipment. The programming takes place via MCD programs and through an integrated interpreter via a computer system with USB or RS232 connection.

Equipment Series

- Cross multiplexer 32 x 4, expandable up to 128 x 8
- Cascadable 96 channel multiplexer for component measuring
- Multiplexer 1 of 16, 16-fold switch
- Input card 32 channels, threshold value programmable
- DA-converter 12 bit
 - Frequency counter 0 ... 10 MHz
 - Controllable power unit
 - Bus cards with breadboard for special structures
- Further cards are being prepared, or can be developed based on customer's need
- For audio- and video measuring, separate modules are available, which can be easily combined with the UMS1300

Connection Possibilities

- Multifunctional card with controller, AD-converter, DA-converter 0 - 10 V / 50 mA
- Measuring of:
- Resistors 0 - 10 MOhm
 - Capacitors 0 - 10000 μ F
 - Connections
 - Diodes
 - Voltages 0 - ± 18 V / 16 bit resolution

System Capabilities

- 3HE, 19" plug-in unit, 480 mm depth
- 120 / 230 Volt AC, 50 / 60 Hz voltage supply
- Approx. 2 Ampere current consumption

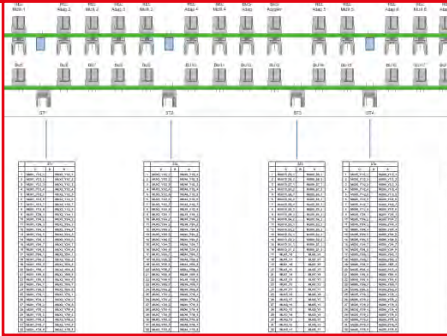
The testing voltage for the components tests can be programmed with the DA-converter. This card also controls the UMS1300. The measuring system can be easily adapted to the respective application.

Order Information

UMS1300 Standard-set

Order number UMS1300 Standard-set

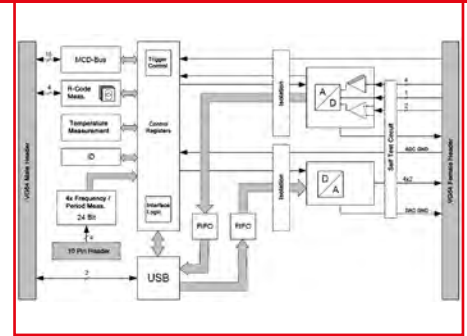
Price 4.580,00 EUR



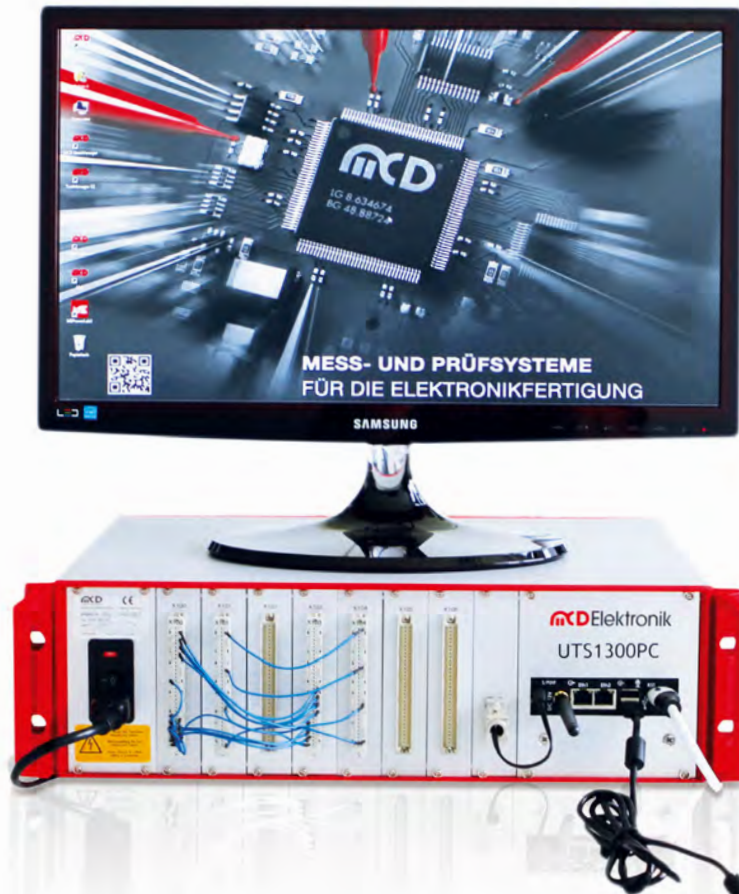
Multiplexing Overview



UMS1300 with Connected ULC Measurement Card



Block Diagram of an ULC Measurement Card





The MCD Universal Measurement System UMS1300 ULC is a measurement system with integrated universal multiplexing. With the ULC measurement card signals can be generated and measured. It is controlled via an USB interface or an integrated PC.

Equipment Series

- ULC measurement card
 - 6x ADW, 500 KHz
 - 4x DAW, 1 MHz
 - 4x counters, logic analysis
 - Self-test, self calibration
 - PWM using the DAW
- 4x relay 4 x 16 multiplexer channels cascadable, readable
- System can be equipped 2-fold

Connection Possibilities

- Function test
- EOL test
- Signal generation and analysis
- Waveform analysis
- Test system with integrated PC
- Training system
- Repair systems
- and much more

System Capabilities

- 3HE, 19" plug-in unit, 480 mm depth
- 120 / 230 Volt AC, 50 / 60 Hz voltage supply
- Approx. 2 Ampere current consumption

Order Information

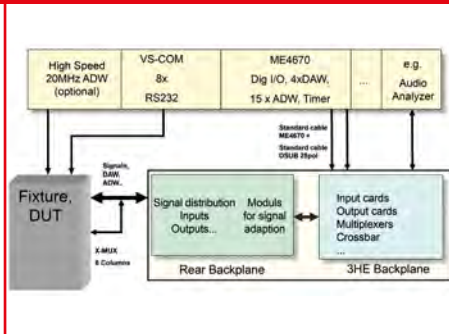
UMS1300 ULC

Order number 118897
Price 7.600,00 EUR

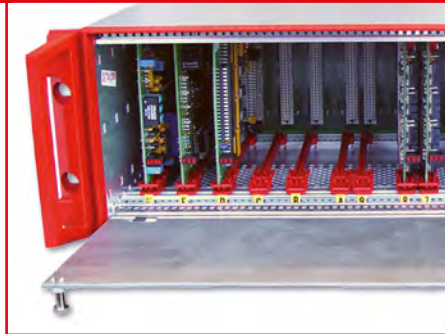
UMS1300 UTS-PC

(incl. MCD Measurement Software TestManager CE)

Order number 119878
Price 9.345,00 EUR



Block Diagram

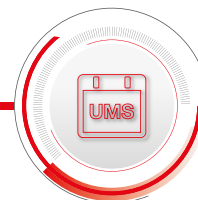


Open Measurement System with Integrated Multifunctional Cards



Meilhaus Multifunctional Card





The Universal Measurement System UMS1300 ME is a PC-controlled modular test system in 19" technology with application equipment. The programming is done by MCD programs using the integrated interpreter via a computer system with a multifunction card from Meilhaus Electronic.

Equipment Series

- 2x MUX 32 x 4, upgradable to 4 pieces
 - 8 out of 32 or 32 on 8
 - 12 out of 32 or 32 on 12
 - 16 out of 32 or 32 on 16
- Switching multiplexer 16 channel / 1 A
- Digital output 32 channel each 12 V / 0,7 A
- Digital input card 32 channel
- 15 ADC channels
- 4 DAC channels PushPull max. 0,3 A
- Transmitter lead operation, arbitrary independent function (dependent on multifunction card)
- Integrated current measurement 4 channel
 - 10 μ A up to 8 A
- Different trigger inputs, opto-decoupled
- Universal MCD Interface to extend multiplexing

Connection Possibilities

- ME4670 or ME4680 Multifunction Card, this card also accepts the UMS1300 control
- Direct multimeter connection with internal current voltage switching
- External power supply for DUT
- Connection for different test adaption

System Capabilities

- 3HE, 19" plug-in unit, 480 mm depth
- 120 / 230 Volt AC, 50 / 60 Hz voltage supply
- Approx. 2 Ampere current consumption

Assembly Multifunctional Cards ME4670 or ME7680

- PCI board inside PC, version with galvanic isolation A-GND to PC-GND
- 16 bit resolution

Order Information

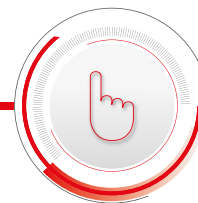
UMS1300 with Multifunctional Card ME4670
Order number UMS1300 ME-Set
Price 7.258,00 EUR

UMS1300 with Multifunctional Card ME4680
Order number UMS1300 ME-Set 80
Price 7.802,00 EUR

The construction of complex systems can be significantly simplified by MCD's control units. Control tasks are distributed to intelligent sub-systems and are controlled by these control units.







Control Unit PIC8IO, MIO1616	Page 148
USB hub 6-Port, switchable	150
USB hub 2.0 8-Port, switchable	152
USB hub 3.0 8-Port, switchable	154
Screening Box	156
Sensor Actuator Box	158
Brush Motor Controller	160
Handheld Tester e.g. for Vehicle Flap Actuators	162



These MCD controls are used for activation and inspection of pneumatically or electrically driven components. The components can be tested through an endurance-run program. Addition modules with I²C interface can be addressed via an RS232 or USB interface.

Equipment Components

- 8 or 16x inputs / outputs
- 4x input as fast event counter/trigger to 10 kHz
- 2 outputs as PWM generator from 10 to 250 Hz, 0 to 100%
- 4x ADC inputs, range 0 to 10 V, 10 bit
- Programmable trigger function on input pattern
- Separate supply voltages for the outputs 1 to 8, 9 to 16 and the supply of control electronics
- Supply and EA voltage 12.. 24 V possible
- Universal IO interface for controlling I²C components, dot-matrix display

Functions

- Operation of several systems via addressable, serial interface
- Storage of values in a non-volatile memory (EEPROM)
- Drive of external modules through I²C-interface
- Text output on dot-matrix optional possible
- Trigger functions on the input pattern
- Mounting on rail is possible

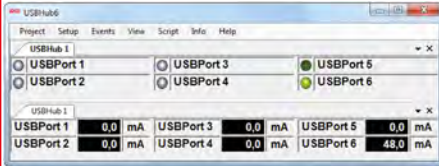
Order Information

Control Unit PIC8IO

Order number	7513
Price	470,00 EUR

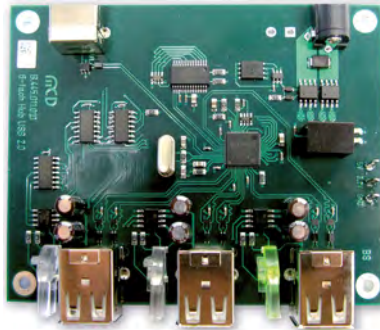
Control Unit MIO 1616

Order number	7587-V3
Price	609,00 EUR



USBHub6					
Project Setup Events View Script Info Help					
USBHub 1					
USBPort 1	USBPort 2	USBPort 3	USBPort 4	USBPort 5	USBPort 6
0,0 mA	0,0 mA	0,0 mA	0,0 mA	0,0 mA	48,0 mA

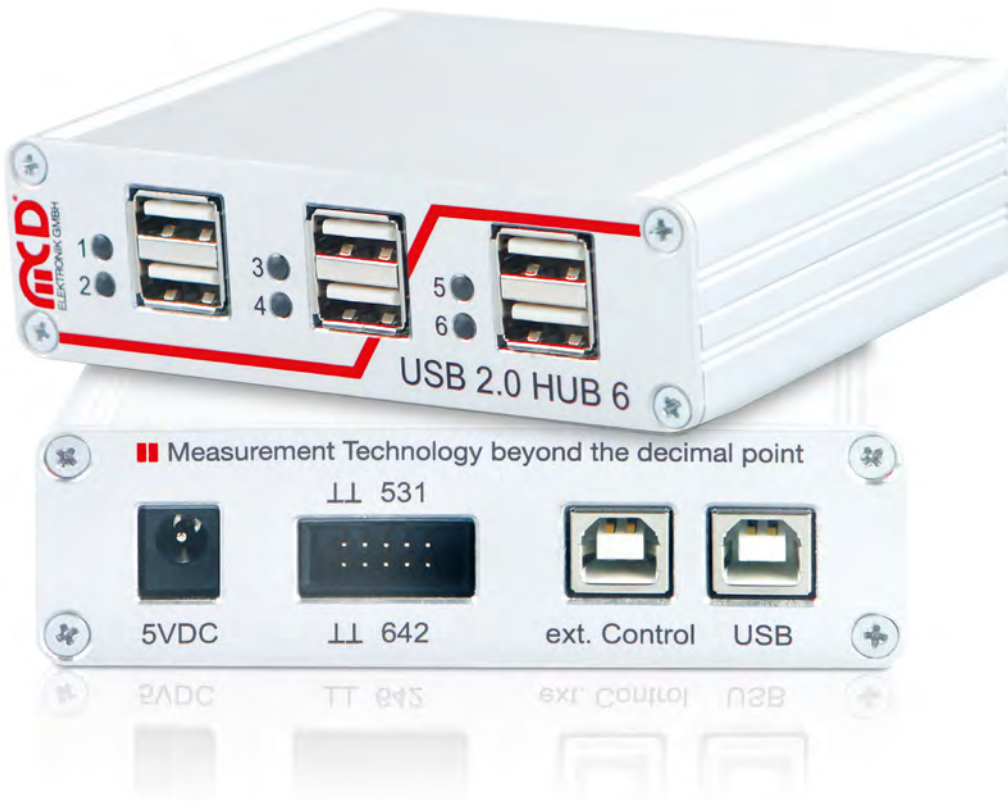
Toolmonitor USB hub with
Integrated Current Measurement



USB hub 6-Port Board



USB hub with six high speed
USB 3.0 Downstream Ports





You only activate the equipment you really need in that given moment. That way, you save energy, protect your hardware and your computer's performance is not compromised.

The USB hub has six downstream ports, which can be individually switched on and off via USB. When switching it off, the supply voltage (+5 V) and the data lines on the semiconductor switches are separated. Ports one to four are turned off after a reset, whereas five and six are turned on (for keyboard, mouse, etc.). The USB hub can operate solely on the USB host (bus-powered), or in addition with a 5 VDC power supply with at least 17 W output power or output current of 3,3 A (self-powered). Connection or disconnection of the external power supply resets the state and the switch ports in their default state. The connector for the external power supply is a DC device socket. The polarity is arbitrary. The USB hub 6-Port with two control inputs can also be implemented for Linux operating systems, if required.

Features

- On and off via USB ports
- Separation of power supply and data lines by a turned-off port
- LEDs to indicate switched ports
- Automatic detection and switching between bus- and self-powered modes
- USB compliant renumbering of hub and connected devices when connecting or disconnecting the power supply
- Back feed from the power supply to the USB host
- Automatic shut-off of congested USB ports with notification of USB hosts
- Control via Toolmonitor USB hub (included in delivery in the form of an USB memory stick) or ASCII commands
- Robust metal housing

Order Information

USB hub 2.0 6-Port, switchable

Order number 119102

Price 395,00 EUR

USB hub 3.0 6-Port, switchable (2 control inputs)

Order number 153780

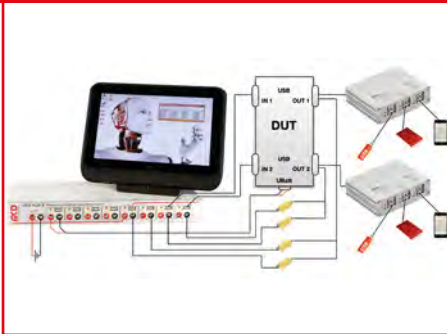
Price 880,00 EUR

USB hub 2.0 6-Port, switchable (2 control inputs)

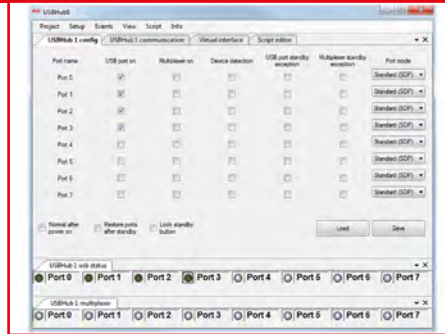
Order number 122536

Price 440,00 EUR

The MCD Toolmonitor USB hub serves as an operator interface for the MCD USB hubs.



Block Diagram USB hub



Toolmonitor USB hub



Connected Devices





You simply activate the devices you really need. This gives you the benefit of saving electricity, protecting your hardware and your computer is not compromised in its performance.

This USB hub has eight downstream ports, which can be turned on and off individually via USB. When switching it off, the supply voltage (+5 V) and the data lines on the semiconductor switches are separated. The control is via the Toolmonitor USB hub (PC software), which is included in delivery in the form of an USB memory stick. Each USB port can be used as standard port (SDP), load-in line (CDP) or as a charger connection (DCP) and provides the connected device up to 2.5 A. Additionally to the USB ports, the USB hub still has a 8-channel relay multiplexer, with a centrally supplied voltage individually on each port (max. 48 V) and independently switchable, e.g. device supply with a voltage other than 5 V. The connection is made via 4 mm banana plugs. Whether or not and which ports are active after switching on the hub (for example, access to the mouse or keyboard) can be stored in non-volatile memory.

Via a button on the device, one can either temporarily shut down all ports or restore the previous switching state of all ports. A storable device number helps distinguish multiple USB hubs 8 on a PC.

For third-party software, the Toolmonitor USB hub can be completely remote controlled. COM / DCOM or a .Net comes - Assembly are used as an interface. This allows the Toolmonitor USB hub to be involved in a variety of applications (MCD TestManager CE, LabView®, Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), OpenOffice®).

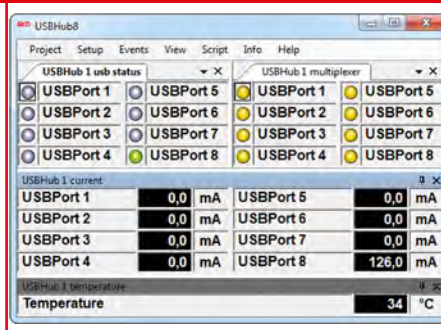
Order Information

USB hub 2.0 8-Port, switchable	
Order number	121142
Price	1.550,00 EUR

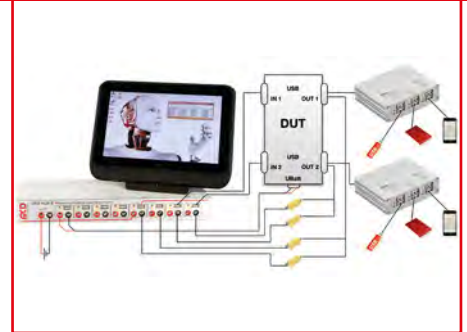
The MCD Toolmonitor USB hub serves as an operator interface for the MCD USB hubs.



Input Connections of the Relays Multiplexer



Toolmonitor USB hub with Current and Temperature Measurement



Block Diagram USB hub





You simply activate the devices you really need. This gives you the benefit of saving electricity, protecting your hardware and your computer is not compromised in its performance. Due to the new USB 3.0 Standard integration, the data transfer rate will increase tremendously.

This USB hub 3.0 has eight downstream ports, which can be turned on and off individually via USB. When switching it off, the supply voltage (+5 V) and the data lines on the semiconductor switches are separated. A useful feature is that there are additional connections at each port on the connected devices that can be supplied with an externally supplied voltage of maximum 30 VDC. A storable number in the device helps distinguish multiple USB hubs on a PC. The control is via ASCII commands or the Toolmonitor USB hub (PC software), which is included in delivery in the form of an USB memory stick. Whether or not and which ports are active after switching on the hub can all be configured and stored.

The ports can also be switched manually via buttons. Optionally, sending commands through the USB 3.0 host connection or the additionally available USB 2.0 port is possible.

Each USB port can be used as standard port (SDP), load-in line (CDP) or as a charger connection (DCP) and provides the connected device up to 2.5 A.

Additionally to the USB ports, the USB hub still has a 8-channel relay multiplexer, with a centrally supplied voltage individually on each port (max. 30 V) and independently switchable, e.g. device supply with a voltage other than 5 V. The relay channels can also be used for different and independent switching operations. For third-party software, the Toolmonitor USB hub can be completely remote controlled.

COM/DCOM or .Net–Assembly is used as an interface. This allows the Toolmonitor USB hub to be involved in a variety of applications (MCD TestManagerCE, LabView®, Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), OpenOffice®). This USB hub 3.0 8-Port can also be implemented for Linux operating systems, if required.

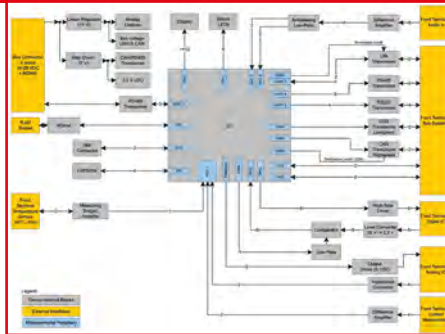
Order Information

USB hub 3.0 8-Port, switchable	
Order number	122204
Price	2.473,00 EUR

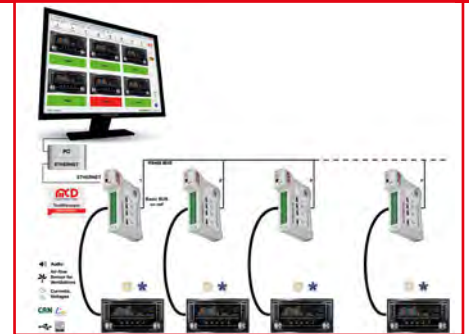
The MCD Toolmonitor USB hub serves as an operator interface for the MCD USB hubs.



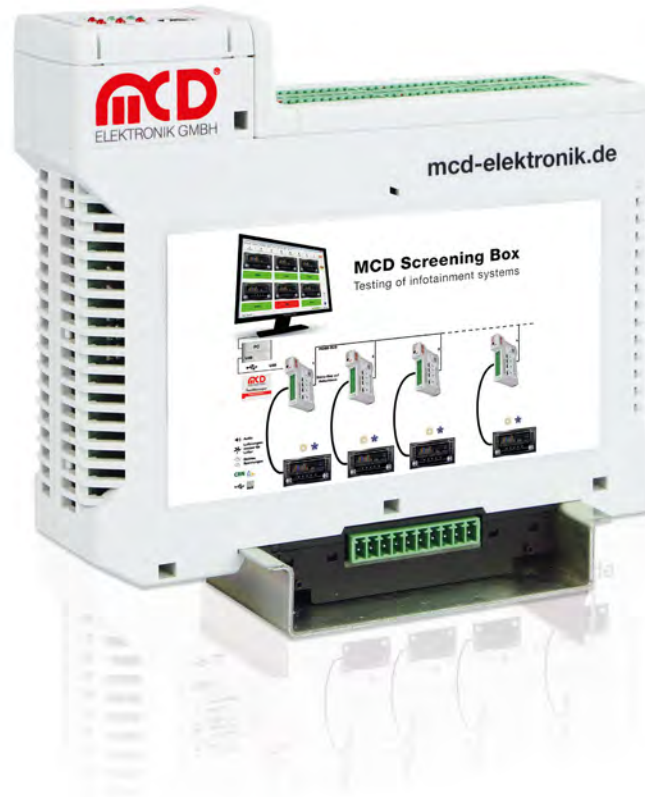
„Slim“ Screening Box



Variety of Interfaces



RunIn/Screening Tests





When operating RunIn- and screening test systems, it is often to examine many similar devices. The samples are addressed and stimulated simultaneously through CAN, LIN, RS232 or I²C. Usually, appropriate hardware is very complex and expensive but due to MCD's flexible system this can now be changed.

Features

- Automatic detection of a loaded and contacted DUT followed by a self-start test
- Measurement of audio signals, voltages, currents, fan functions, temperature, frequency
- Accessible via Ethernet interface and DIN rail bus; scalable application
- Configuration of the boxes via Ethernet
- Transfer of the data to the TestManager CE

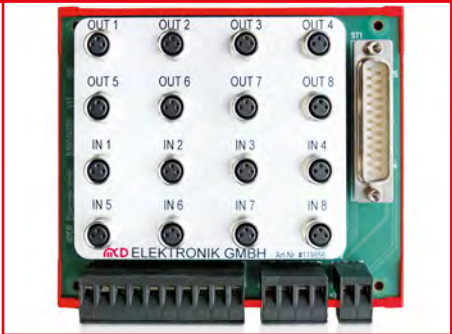
Equipment Components

- Two CAN interfaces with low- / high-speed transceiver (11 bit and 29 bit support)
- LIN interface for master and slave operation
- Software-controllable scheduling
- RS232 and RS485 interface
- Eight digital outputs; two PWM capable of up to 10 kHz switching frequency and 10 bit resolution
- Threshold voltage of 0 V to 30 V programmable
- Frequency measurements up to 200 kHz
- Four differential measurement channels with a resolution of 12 bit
- Input for temperature sensors with 1 K resolution
- Two differential analog inputs (0-30 V)

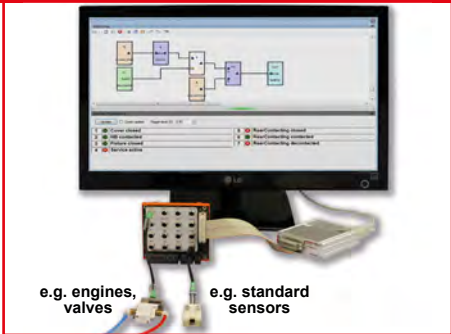
- Differential input with a range from 0 mV to 50 mV and a programmable gain for current measurements
- Operating status LEDs on the front side
- Operation via connectable HMI module with two-line LC-display and rotary encoder but also operated as a stand-alone solution
- Permanent memory on the module stores the setting parameters
- Synchronous configuration by Ethernet interface
- For decoupling of the samples of the measurement control, the Ethernet ports are galvanically isolated

Application Examples

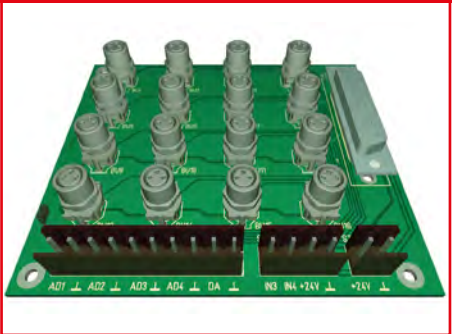
- Preparation and execution of the tests already in the planning phase
- Test of infotainment systems
- Stress test / RunIn / Endurance test
- Endurance test under temperature
- Monitoring of the audio outputs, streams, controls
- Universal gateway for bus interfaces



Connection Overview

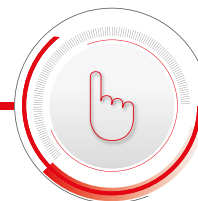


Exemplary Interaction of MCD Devices and Toolmonitor



3D Mechanical Design View





This board offers the possibility to connect different sensors and actuators with standard cables and without wiring effort. In combination with the control unit PIC8IO, a central controlling and monitoring of the connected signals is possible.

Connections

- ST1: Sub-D connector 25-pole
- ST2: Weco 2-pole plug-in screw terminal
- ST3: Weco 10-pole plug-in screw terminal
- ST4: Weco 4-pole plug-in screw terminal
- BU1-16: Sensor actuator mounting socket 3-pole with a M8 thread
- Mounting rail TS35

Functions

- ST1: Connection to mechanical control unit PIC8IO via flat cable
- ST2: Connection facility for 24 VDC supply voltage and GND
- ST3: Connection facility for 4 DC signals for detection via ADW and provision of 1 DC signal via DAW
- ST4: Alternative connection for sensor signals IN3 and IN4
- BU1-16: Up to 8 sensors and 8 actuators can be connected through a 3-pole standard cable with M8 thread

Order Information

Sensor Actuator Box

Order number 119859

Price 235,00 EUR



Implemented Brush Motor Controller

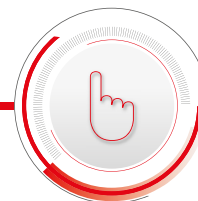


Screw Terminal and Connectors



Connection Overview of the Module





This module was primarily developed for the control of so-called flap actuators. Now, this component is basically used for the testing of PWM controlled assemblies because its interfaces and functions simplify the operation with systems for force/displacement measurement.

Equipment Components

- Motor driver
- PWM output
- Programmer connection
- Power supply for Hall sensor
- SSI connection for position sensor
- Input for quadrature encoder or pulse encoder with directional signal
- Analog inputs
- Torque sensor with a measuring range ± 10 V
- AUX measurement input with a measuring range of 18 V
- PID controller
- USB 2.0
- Male connector 2x3 pins
- Male connector Samtec IPL1 1x5 pins
- Green and red status LEDs as a control indicator

Functions

- Peak current limitation configurable at four levels
- Automatic shut-off on short circuit or overheating
- Measurement of motor current between H-bridge and motor
- Functions for compensation and communication with flap actuators and PWM controlled assemblies
- Control measurements in the measuring range of 10 V for Hall sensor power supply
- Signal from Hall sensor in 5 V measuring range
- Acquisition of signals with up to 131.071 measurement points
- Pre-trigger and post-trigger options
- Trigger behavior and control range are largely configurable
- Control output can be switched to PWM output or motor driver

Order Information

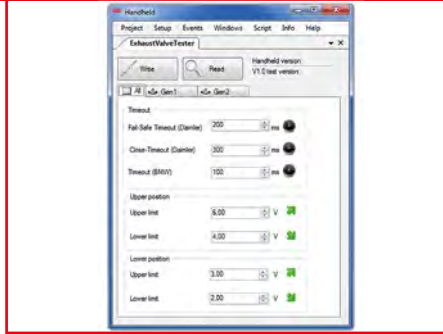
Brush Motor Controller

Order number 123114

Price 1.675,00 EUR



Exemplary Application



User Interface of the Toolmonitor



Various Automatically Recognized Connector Plugs





For a short-intervalled testing of PWM, SENT or analog controlled assemblies and components, this cell powered handheld device was developed. Because of the flexible programming of the firmware an usage in many different areas is possible.

Features

- Automatic detection of contacted DUTs and sourcing of measurement program
- Test of measuring cable by application software
- Capacity check of battery provision
- Acoustic support by integrated speakers
- Clear monitoring and output of measurement data by touchpanel display
- Pass / Fail monitor
- Updatable for prospective DUTs
- Flexible application scenario with battery operation

Equipment Components

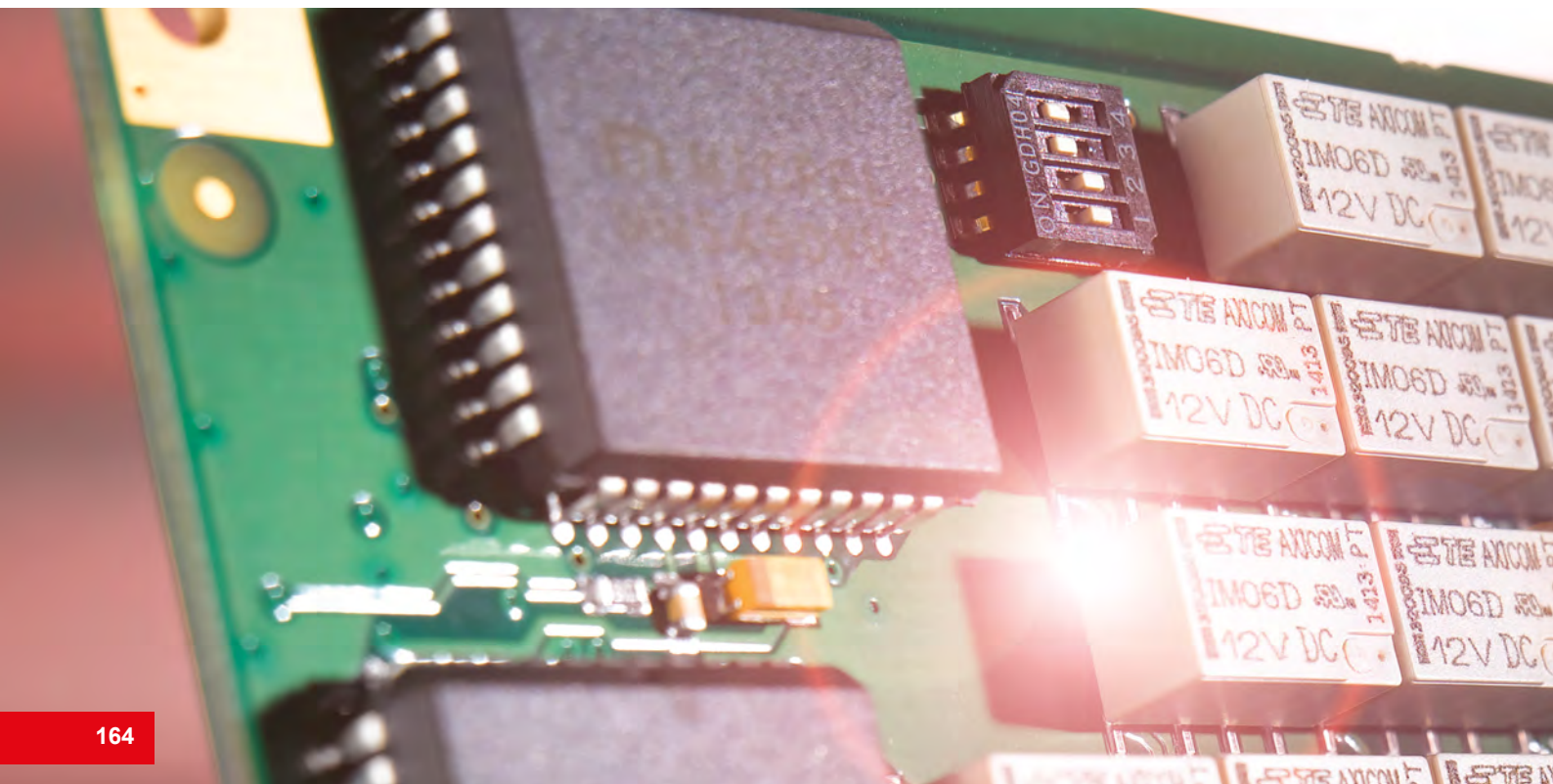
- 4,3" LCD touchpanel with graphical interface
- Battery with a capacity of 3000 mAH or conventional batteries (if necessary)
- External power supply (9 up to 17 V, typical 12 V)
- Sensor input for analysis of analog signals
- Serial RS232 interface for remote control
- Integration to measurement software TestManager CE
- Miniature loudspeakers
- Stand-by switch with start button
- Strong measurement cables for the use of different connection plugs

- Bilingual manual and user guidance (german/english), other languages are possible
- Control of the DUTs using different BUS types (e.g. CAN, LIN, RS232, etc.). Additional interfaces to the DUTs can be custom-designed

Application Examples

- Functional testing of PWM, SENT or analog controlled assemblies and components
- Testing of switch assemblies with or without BUS control
- Testing of lighting unit with or without BUS control
- Testing of vehicle flap actuators or other stepper motors
- Functional testing of wiring harnesses
- Functional testing of various actuators and valves
- Mobile test systems for service stations
- Diagnosis of control units for automotive or medical applications
- and much more

MCD develops special boards for multiplexing and various types of signal processing. Through the use of the MCD Toolmonitors, these cards can be controlled with any programming language.

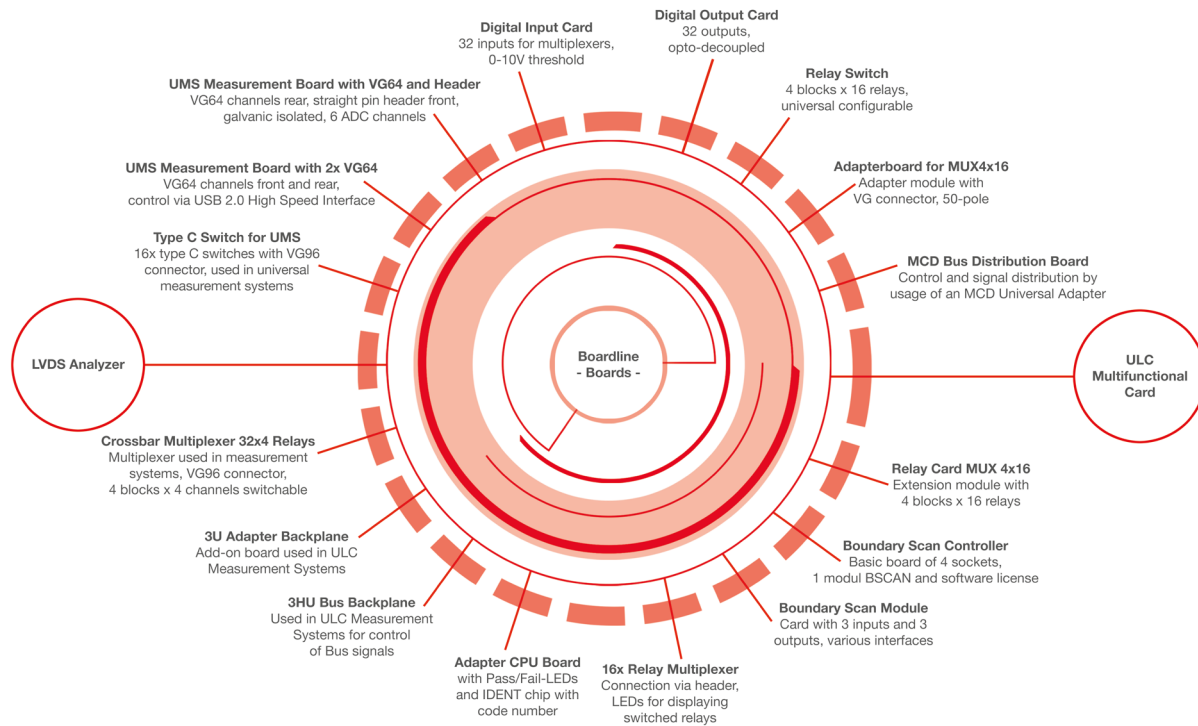




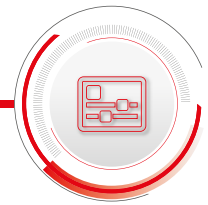


Overview of BOARDLINE Boards	Page 168
LVDS Analyzer	170
ULC Multifunctional Card	172

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172



Overview of all boards that are contained in the product line BOARDLINE.



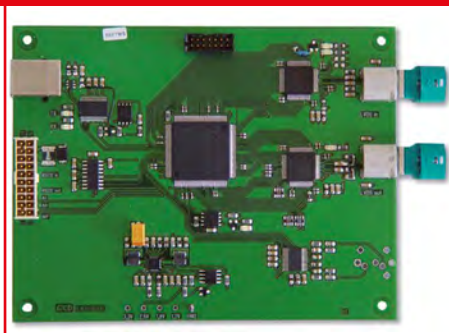
MCD Elektronik offers its customers standard boards as well as individual boards for the most different requirements, which can be directly controlled by the software solutions. Thereby, the construction of the boards is coordinated according to the measurement tasks.

To adapt the measuring tasks, you have many special boards available upon request, such as:

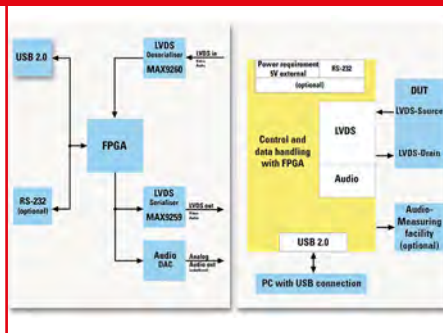
- I²C - Port Expander
- I²C - Relay Board
- Video- and audio amplifier
- Power switch
- USB-controllable and scalable control electronics
- Current measurement cards
- LIN converter
- Controller cards
- Interface cards

The following pages present the most important basic boards in detail. Information of all other board solutions can also be found on the company's website and in MCD's Online Shop:

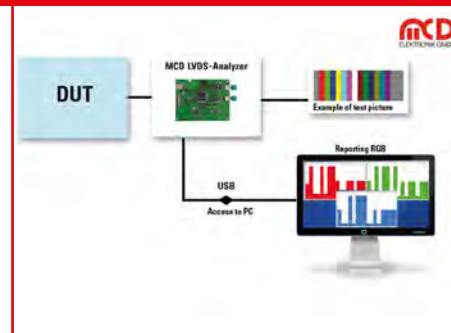
www.mcd-elektronik.com/products/boardline
shop.mcd-elektronik.com/Boardline/



LVDS Analyzer Board



Block Diagram



Example of a Data Evaluation

Technical Data

— Connection LVDS input	Rosenberger D4S20G-400A5-Z
— Connection LVDS output	Rosenberger D4S20G-400A5-Z
— Connection analog audio output	Jack Socket 3,5 mm Stereo
— USB port	USB B
— Horizontal resolution	1 - 16 pixels
— Vertical resolution	1 line
— Color resolution	8:8:8 RGB (24 bit)
— Pixel clock	58 MHz max. (corresponds to approx. 17,2 ns)
— Line width	1 - 2047 pixels
— Detectable line	Line 1 - 2047
— Number of detectable lines	1 per measurement
— Synchronization input	HSYNC, VSYNC, DATA ENABLE, positive or negative logic
— Synchronization output	HSYNC, VSYNC, DATA ENABLE, positive or negative logic (pulse length with 1 pixel resolution or definabel to obtain from Input)
— Pixel clock output	Refer from entrance or 18 MHz, 27 MHz, 29 MHz, 36 MHz, 54 MHz or 58 MHz
— Current consumption	Max. 200 mA



The LVDS Analyzer was developed as part of a test system. With the LVDS Analyzer, the digital color information of any line within a video image can be recorded and evaluated. In addition, a 2-wire LVDS signal from one of four inputs is deserialized and the information contained within is recorded.

General

- 5 V power supply via the USB port
- Control and data transfer via USB 2.0 or RS232
- Use of diagnostic functions of LVDS-Switch and Deserializer as:
 - Recognition of a LVDS cable error on the LVDS output
 - Recognition of an existing connection (lock-signal)
 - Use of pre-emphasis on the LVDS output
- LVDS Switch and Deserializer via USB can be switched on and off

LVDS inputs

- Deserialization of the LVDS data streams with MAX9260 from Maxim Integrated Products Inc.
- Demapping into RGB data, HSYNC and VSYNC
- Analog output of the I²S audio data stream via digital/analog converter
- Remapping for different target devices is possible
- Measurement of the geometry of image acquisition by means of HSYNC, VSYNC and pixel clock

- Detection of a video line at full resolution up to 2047 pixels
- RGB color resolution up to 24 bit
- Capturing a still image is possible through multiple line scanning
- Reduction of the resolution to increase the measurement speed is possible

LVDS outputs

- User definable test pattern with up to 2047 pixels width and row height; horizontal gray- and color gradients also possible
- RGB color resolution up to 24 bit
- Mapping of the color and sync signals to the target device
- Synchronizable to the sync signals of the input
- Generating its own sync signals HSYNC, VSYNC and DATA ENABLE from the pixel clock
- Availability of the pixel clock from the input signal or its own clock generator (18 MHz, 27 MHz, 29 MHz, 36 MHz, 54 MHz, 58 MHz)

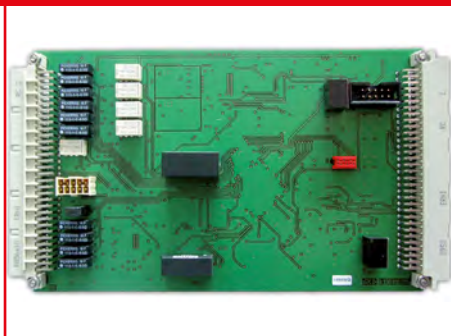
Order Information

LVDS Analyzer, USB
MAX9259/MAX9260

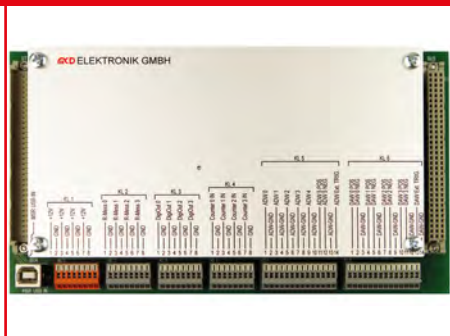
Order number 140051
Price 1.590,00 EUR

LVDS Switch Analyzer, USB, RS232
MAX9259/MAX9260

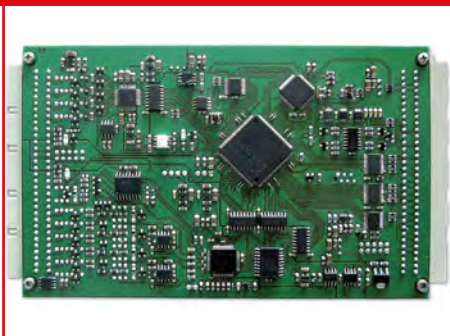
Order number 118404
Price 1.590,00 EUR



Front of ULC Multifunctional Card



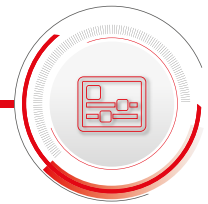
Version with base plate for cabinet applications



Back of ULC Multifunctional Card

Technical Data

Size	Europe Card (without connectors)	160 mm / 100 mm
Supply voltage	max. 6 W	12 V DC
Controlling	USB 2.0 High Speed	
Connectors	Analog input / output #140089 Analog input / output #140090 Analog input / output #140091 4 channels Resolution	VG64 (female) multipoint connector 2x32 pol pin header / VG64 pin header 2x32 pol pin header +/- 10 V / 2 mA 16 bit up to 1 Msample/s
Analog outputs	Useful as functions generator Galvanic isolation TTL 4 channels MCD bus 4 channels (single ended) 1 channel (single ended) 1 channel (differential) Resolution All analog channels grope synchronic Galvanic isolation 5TTL (LVTTTL compatible) 4 channels 4 channels Mint current Measurement range Resolution	of analog inputs and remaining circuitry Trigger-Out; PWM up to +/- 24 V up to +/- 24 V up to +/- 24 V 16 bit up to 500 kSample/s of analog inputs and remaining circuitry Quadrature encoder, period / frequency measurement 100 μ A up to 10 kOhm 5 Ohm
Digital outputs		
Analog inputs		
Digital inputs		
Measurement of resistors		



The ULC Multifunctional Card is equipped with a complex FPGA device that provides many possibilities (A/D, D/A, logic, analysis, counter, self-testing, calibration...) via an USB interface.

A/D Section

The test card has a total of six bi-polar analog input channels, one of which is a differential input and the remaining ones being single ended. All channels are sampled synchronously. The sampling rate has a maximum of 500 KHz for all channels.

D/A Section

The D/A converter has four identical channels. On these channels DC values or arbitrary waveforms can be put out at a sampling rate of up to 1 MHz.

Frequency Counter and Logic Analysis

The counter inputs can evaluate pulses and frequencies. In addition, the inputs can be used for logic analysis.

Self-test, Self-calibration

AD and DA are equipped with an intelligent self-test device that can be used for self-calibration.

The ULC Multifunctional Cards are delivered with a DAkKS calibration by default.

Order Information

ULC Multifunctional Card (USB)

Order number	118928
Price	1.576,00 EUR

ULC Multifunctional Card with Base Plate for Cabinet Applications

Order number	150066
Price	1.850,00 EUR

PC-based MCD hardware components, in functional interaction with our Toolmonitor AudioAnalyzer or TestManager Classic Edition measurement software from our Softline, outline a cost- and space-saving alternative to stand-alone devices.



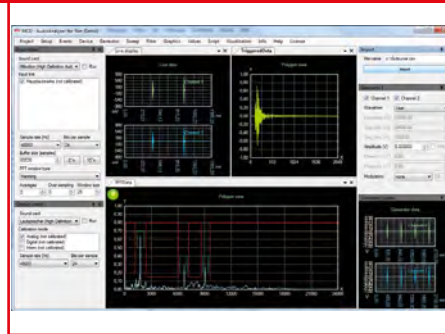




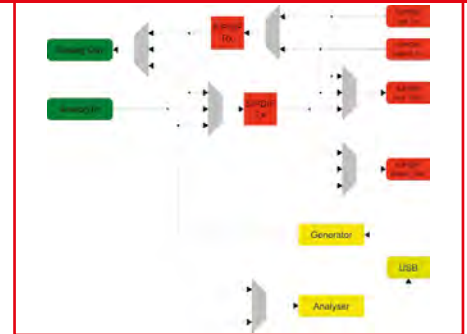
AudioAnalyzer	Page 178
VideoAnalyzer and Generator	180
Output / Input Audio Switch	182



Analyzing the Clicking Sound of a Defective Flasher Relay



Testing the Clicking Sound of a Flasher Relay



Schematic Diagram of Signal Paths



Input / Output:

- Analog
- Digital
- S/PDIF Optical
- S/PDIF Electrical

Functions:

- Oscilloscope
- FFT spectrum
- RMS, THD
- Distortion

- Frequency
- Generator, modular
- Frequency Response Measurement

Functional Test:

- Audio Tester
- Signal analysis
- Generator
- and many more



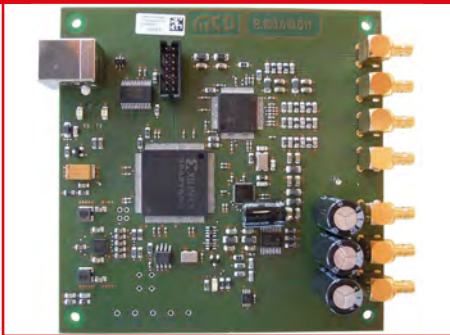
The AudioAnalyzer from MCD Elektronik is used for stimulation and analysis of audio signals in both the analog and the digital domains. The S/PDIF audio signals can be analyzed or placed to the analog outputs. In conjunction with the Toolmonitor AudioAnalyzer, a complete AudioAnalyzer with excellent measurement data can be realized. The input range can be switched in steps between 1-2-5-10 and between 10 mVrms to 50 Vrms. This Analyzer is connected to the PC that is to be controlled via an USB interface. The following connections are available:

Input	Output
Analog XLR (Input Range 10 mVrms until 50 Vrms)	Analog XLR (Input Range 10 mVrms until 15 Vrms)
Digital optical S/PDIF until 192kSps	Digital optical S/PDIF until 192kSps
Digital electrical S/PDIF until 192kSps USB 2.0 High Speed	Digital electrical S/PDIF until 192kSps USB 2.0 High Speed

The AudioAnalyzer.Net is a software based solution for the analysis and generation of analog and digital signals in the audio range. In this case, standard PC components with Microsoft® Windows XP or below operating systems can be used (including Windows7®). For analysis of the audio signals in addition to the frequency and signal strength of various measurements, measurements of the distortion factor and the FFT Spectrum are possible. Through the integrated signal generators, different waves and modulation forms are generated. The surface of the AudioAnalyzer can be widely adapted and adjusted to varying applications. All functions of the AudioAnalyzer can be controlled using a COM server interface from other Windows programs. The obtained values can also be integrated into a variety of programs.

Order Information

License fee for Software package AudioAnalyzer	AudioAnalyzer (analog + digital), Desktop Version
Order number 2559SKLIZ	Order number 121374
Price 946,00 EUR	Price 1.680,00 EUR
AudioAnalyzer (analog + digital), Rack Version	AudioAnalyzer (analog + digital), integrated PC
Order number 121158	Order number 121372
Price 1.680,00 EUR	Price 2.499,00 EUR



FBAS Board with Connectors



Test Image Pattern 3



Test Image Pattern 2





The VideoAnalyzer and Generator SD (single density) can convert analog video signals in composite and S-Video or RGB format or color difference signals; these are digitized according to NTSC or PAL format and it also can generate such a signal. Power supply and control via the USB 2.0 High Speed Connection.

Equipment Components

- USB port for powering and controlling Analyzer Generator
- 4 inputs
CVBS
Y-C
RGB
Y-Pb-Pr
- 3 outputs
CVBS, Y C
RGB
Y-Pb-Pr

Application

- FBAS Video Generator
- VideoAnalyzer for analog video signals
- Use as a broadcasting center for analog video signals
- Examination of video amplifiers
- Testing of analog video interfaces
- Fully automated test systems for infotainment systems
- Display Tester
- and many more

General

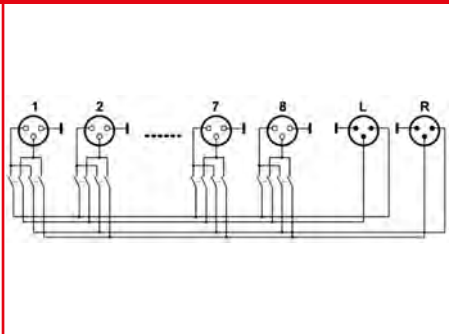
The device is available as a combined unit with VideoAnalyzer and Generator, or just as the Generator. This unit can be controlled remotely via our MCD Toolmonitor. Self-defined test patterns can be loaded via the USB interface.

Order Information

Video Generator CVBS/S-Video
Order number 119836
Price 586,00 EUR

VideoAnalyzer, Generator CVBS/S-Video
Order number 119163
Price 1.350,00 EUR

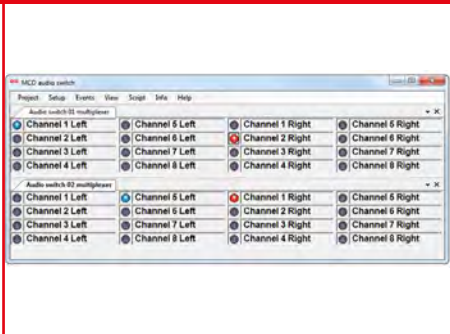
License fee for Toolmonitor VideoAnalyzer CVBS
Order number 119078
Price 245,00 EUR



Circuit Diagram of the Audio Switches



Connection Indicator via LEDs



Toolmonitor Audio Switch





These hardware components are used as switching devices for input or output signals. Up to 16 devices can be connected in series, enabling the connection for up to 128 input or output channels.

Equipment Components

- Size: 44 mm x 350 mm x 135 mm
- Weight: 1,65 kg
- USB 2.0 or RS232 interface for power supply and controlling
- Eight input or outputs connected to signal source
- Two XLR pin sockets or 2 XLR connector plugs each as connection to MCD AudioAnalyzer
- Ten status LEDs

General

The input and output channels can be switched on the two input and output channels of the MCD AudioAnalyzer. The devices are controlled via either USB 2.0 or RS232C interfaces on the reverse side of the Audio Switches.

Active connections to the busbars are displayed by blue and red status LEDs at each input and output channel.

By purchasing these hardware components the Toolmonitor Audio Switch for digital controlling of input and output channels is directly included.

For third-party software, the Toolmonitor Audio Switch can be fully remote controlled. COM/DCOM or .Net-Assembly is used as an interface. This allows the Toolmonitor to be integrated in a large number of applications (Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), Open Office®, LabView®, MCD TestManager CE).

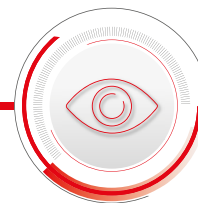
Order Information

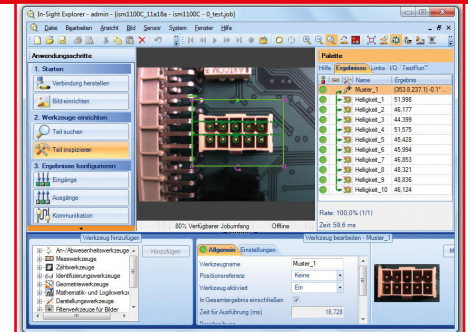
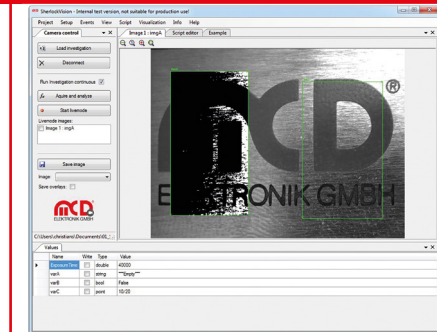
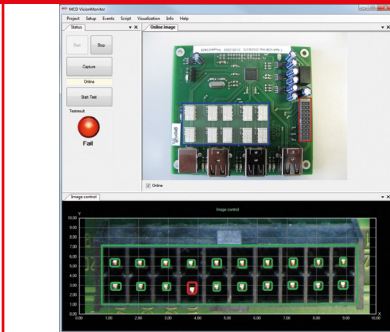
Output Audio Switch, Desktop Version
Order number 122083
Price 1.675,00 EUR

Input Audio Switch, Desktop Version
Order number 122084
Price 1.675,00 EUR

MCD software components for all areas of image processing.







Swash Circuit Inspection with the Toolmonitor Vision

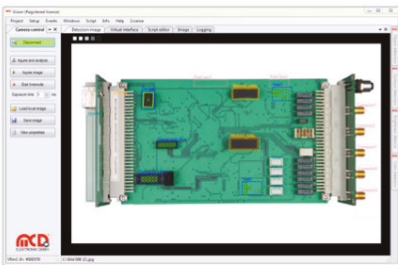
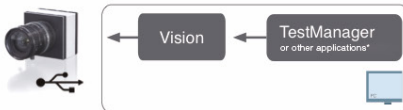
Contrast Check with Toolmonitor Sherlock Vision

In-Sight-Explorer / EasyBuilder in Toolmonitor COGNEX Vision



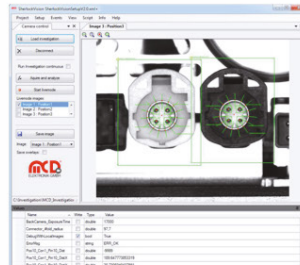
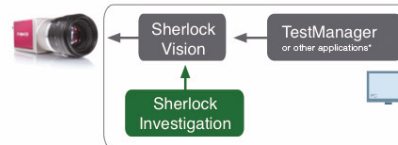
Toolmonitor Vision

- Simple, inexpensive solution basically for industrial image processing tasks
- 4 basic modules: contour detection, brightness detection, object detection and color detection
- Utilization of USB cameras
- Application:
 - Completeness and symbols check, for example testing of completeness and/or the mounting of components
 - Testing of pictograms on switches, operating device panels
 - Recognition of contour and positions of components and simple models in searching sectors
 - Brightness detection in 8-bit grey levels as well as color detection in RGB, HSL or taugt colors



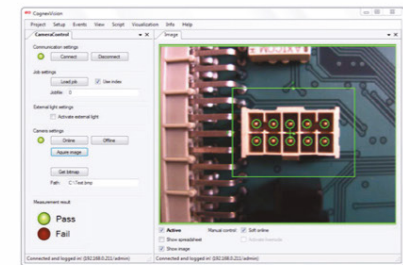
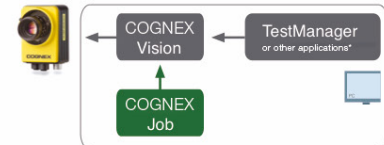
Toolmonitor Sherlock Vision

- Flexible solution for sophisticated industrial image processing tasks
- Independent imaging software "Common Vision Blox" from Stemmer Imaging (GigEVision, USB,...)
- Flexible integration of different camera systems
- Application:
 - Definition of searching sectors, limits and test values, optical swash circuit inspections
 - Completeness check
 - Testing of quality characteristics
 - Detection of LED colors, presence and position accuracy of components
 - Adjustment and tracking of camera images via "live mode"
 - Detection and testing of matrix codes and barcodes



Toolmonitor COGNEX Vision

- High-end solution for sophisticated industrial image processing tasks
- Directly processing of imaging algorithms in intelligent cameras
- robust, intelligent In-Sight cameras with integrated processors of the company COGNEX
- Application:
 - Definition of searching sectors, limits and test values, optical swash circuit inspections
 - Completeness check
 - Testing of quality characteristics
 - Detection of LED colors, presence and position accuracy of components
 - Adjustment and tracking of camera images via "live mode"
 - Detection and testing of matrix codes and barcodes





With the Toolmonitors „Vision“, „Sherlock Vision“ and „COGNEX Vision“ MCD Elektronik has introduced three solutions for visual, industrial quality assurance. All these imaging packages are based on a flexible MCD Toolmonitor and a camera system.

The toolmonitors Vision and COGNEX Vision are already utilized successfully for optical tests in the automotive industry. Especially in complex tests of external or internal mirrors, MCD Vision has established its test security. This tool supports all of the test procedures, from mirror position, arching, measuring and marking of mirrors up to testing of connector contours and illumination.

The Toolmonitor COGNEX is characterized by testing accurately with operating device units, parking brake switches and power window assemblies, as well as Wi-Fi modules, boards or connectors.

The software component Sherlock Vision is actually used for completeness checks of infotainment systems. The software also tests the color of connector plugs, the swash circuit inspection of contacts, the

presence of labels and markings, as well as the wholeness of screws.

Thresholds for the tests are created and the testing of the image acquisition to the analysis are performed within the MCD Toolmonitors. Using an integrated script engine, it is possible to further integrate customized algorithms.

For third-party software, the Toolmonitor can be fully remote controlled. COM/DCOM or .Net-Assembly is used as an interface. This allows the Toolmonitors to be integrated in a large number of applications (Microsoft Visual Studio® (C#, C++, Visual Basic), Microsoft Office® (e.g. Excel®), Open Office®, Lab-View®, MCD TestManager CE).

Order Information

License fee for Toolmonitor Vision		Toolmonitor Sherlock Vision		Toolmonitor COGNEX Vision	
Order number	121003	Order number	150249	Order number	121002
Price	445,00 EUR	Price	445,00 EUR	Price	445,00 EUR
each further module	200,00 EUR				

Good project management, from inquiry to installation of the system is efficient and targeted. In the after-sales service, MCD engineers are readily available. Throughout the product life cycle of our systems, we support our customers and can be available on site, even far beyond the borders of Germany.







Customer Training



MCD Muffins



Employee Training



Order Information

TestManager Advanced Training
1 - 2 participant/s, 3 days
Order number 117200
Price 2.600,00 EUR

TestManager Advanced Training
Maximum 4 participant/s, 3 days
Order number 117200-4
Price 3.900,00 EUR



MCD training ensures that your new system is used productively, operated safely and maintained efficiently from the first day onwards. Our courses are geared to the needs of the customer.

Part of the training is conducted as a workshop, i.e. participants deal with the processing of practical tasks. To learn the software through demonstration videos and working on the computer during the training sessions is easy. In addition, the use of the already user-friendly and clear surface of the software is explained in more detail by our staff and developers. The training period is 3 consecutive days and the group size should not exceed 4 students, so each participant can be treated individually. We recommend training in-house, so that all participants can concentrate on the training contents. Alternatively, training can be performed locally.

We offer the following:

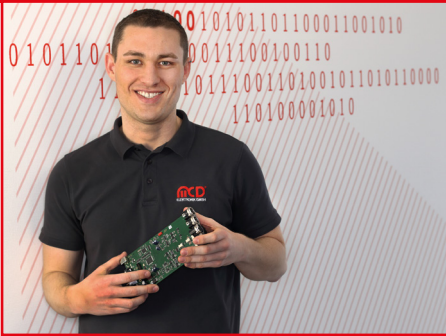
- Courses at MCD in Germany, Hungary and China
- Courses in English, German, Spanish and Hungarian are possible
- Low number of participants ensures a friendly atmosphere
- Comprehensive course manual
- Practical exercises with hardware and software
- Create your own training program
- Training can be conducted on the desired system

Training plans can be customized to meet specific requirements. **Please contact us for an individual training plan so that we can create an appropriate offer.**

Order Information

TestManager Basic Training
1 - 2 participant/s, 3 days
Order number 117199
Price 2.600,00 EUR

TestManager Basic Training
Maximum 4 participant/s, 3 days
Order number 117199-4
Price 3.900,00 EUR



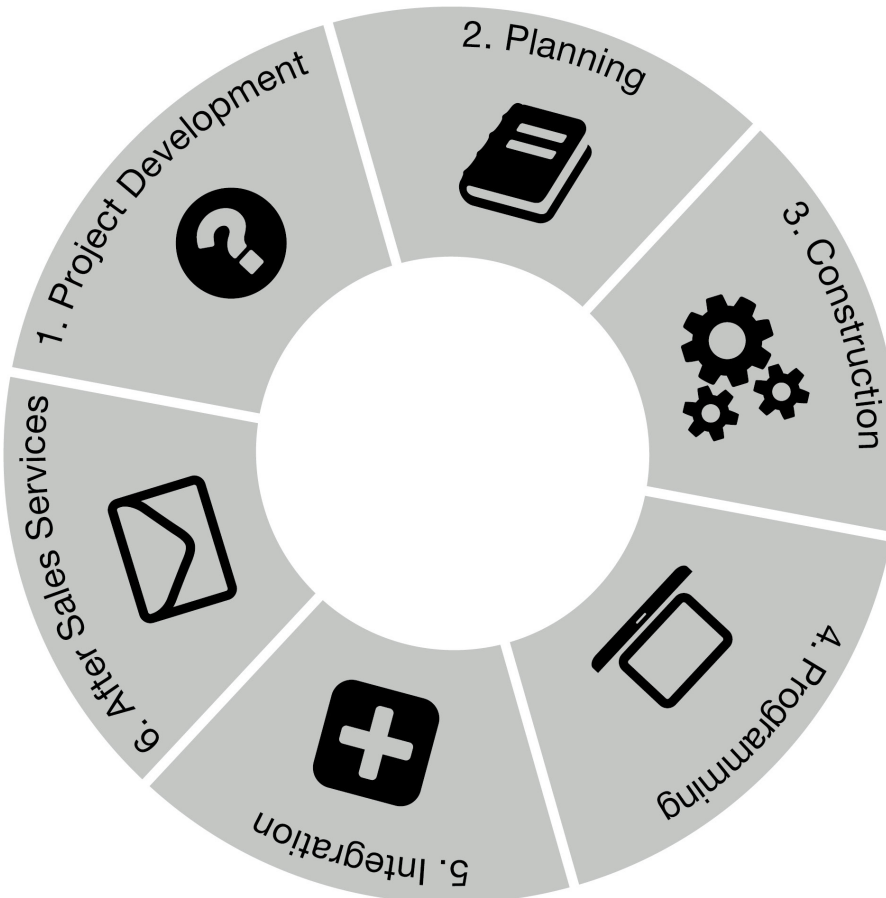
Service



Calibration



Documentation



❶ Project Development

- Selection of appropriate technical measurement equipment
- Analysis of test criterias and framework conditions
- Coordination of requirement specifications

❷ Planning

- Visualization and electrical planning of projected test systems

⚙️ Construction

- Error prevention and detection take place in the design and construction phase

💻 Programming

- MCD TestManager Software
- Application of predefined or individual test steps
- Simple configuration of parameters and limits

⚡ Integration

- Commissioning of mechanics
- Installation of measurement technology and test software

☑️ After Sales Services

- Global Support
- Extensive Trainings
- Calibration



MCD's top priorities are service and availability. Our service staff will accompany the projects from the beginning of the technical aspect, through to commissioning at the customer's base and also ensure a smooth operation of our systems.

Furthermore, the service team advises our customers on the system operation and maintenance, through revisions, updated systems or individual components and supplies spare parts.

From our service center in Birkenfeld we can log into data networks of MCD systems all over the world, to detect possible causes and provide the necessary service and repair requirements quickly. This customer focus has been rewarded with top marks in surveys.

If, despite our high quality standards, the customer experiences a problem with our test systems, our service team can be on site quickly to fix the error and minimize the non-productive work time.

Calibration

Our universal measurement systems (UMS) - are associated with the boards and calibrated immediately prior to delivery. The calibration equipment is of course traceable to the National Institute for Science and Technology. The calibration equipment used is documented in the calibration certificate and is traceably subject to regular inspection.

The customer's calibrated equipment is provided with an interval label that includes the date of calibration and required recalibration.

The results of the calibration are stored in a calibration certificate with a separate measuring protocol and deposited in a database. Upon request, we would be pleased to perform a recalibration at your site.

Order Information

Whether it's calibration, service or repair -
We are more than pleased to put together individual offers.

✉ info@mcd-elektronik.de
☎ +49 (0)7231 / 78 40 5-0

MCD is present in relevant magazines



MCD in the Press



"The new Test System Series - Versatile and Future-proof"
meditronic-journal, June 2018



"Software Tools for Optical Test Processes"
EPP, February 2018



"Precise and Reliable Measurement Technology Beyond the Decimal Point"
ATZ, June 2017



"External Providers help at the Triumph of Electric Mobility"
Produktion, March 2019





"RF Test System for Multifunctional Antenna Tests"
EPP, April 2019





"At the Borders of Feasibility"
TOP100 Innovational Champions, August 2019

More application reports: www.mcd-elektronik.com/downloads

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