

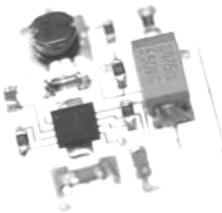
We develop success



# Company structure / Vision



**Mechanics/  
precision engineering**



**Electronics**

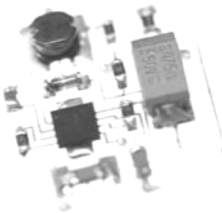


**Laboratory**

TRIKON develops, verifies and manufactures mechatronic products –  
**with all their heart and soul!**

# Competencies

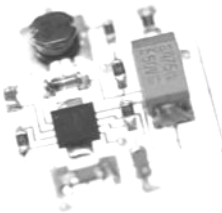
- Realization of innovative solutions for complex subassemblies and complete product systems
- Development of tool based components
- Prototyping
- Technology of electric contacts



# Services

## Product development

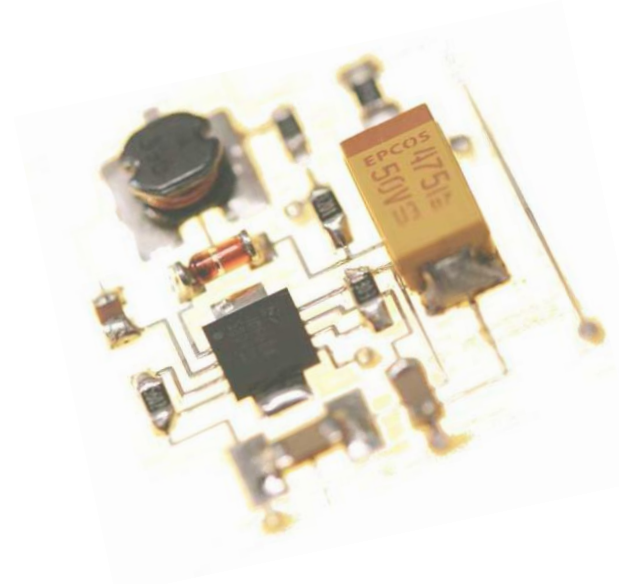
- Entire projects or subtasks
- Specifications and lists of requirements
- Concept creation, feasibility examinations and product analysis
- Modelling, prototyping and sample creation for each phase of product development
- Mechanical, thermal and magnetic simulations
- Development and detailing in 3D and 2D
- Hard- and software development, software prototyping
- Mounting and testing of sample circuit boards
- Design reviews
- Examinations and tests in support of development



# Electronic services

## Overview

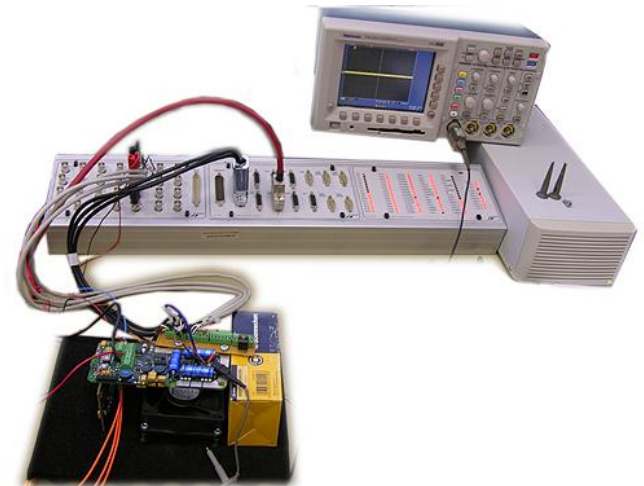
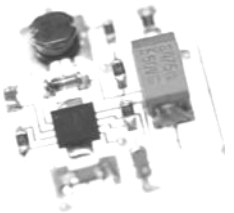
- Specific know-how in drive engineering
- Competence in switching power supplies and Li-ion battery packs
- Code simulation and software prototyping
- Planning and execution of hardware and software reviews and tests
- EMC compatible PCB design
- Software development for a wide variety of microcontrollers and DSPs
- Windows™ programming
- Labview programming according to NI- styleguides



# Electronic services

## System analysis and software prototyping

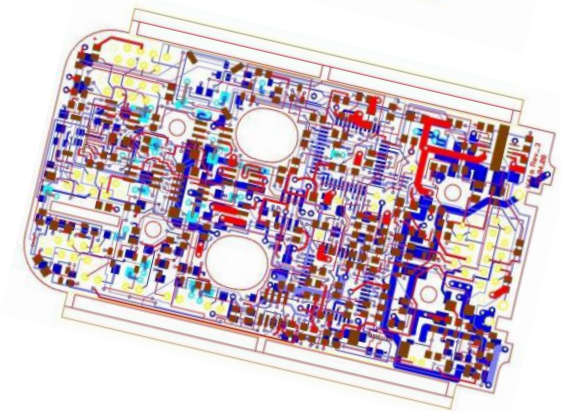
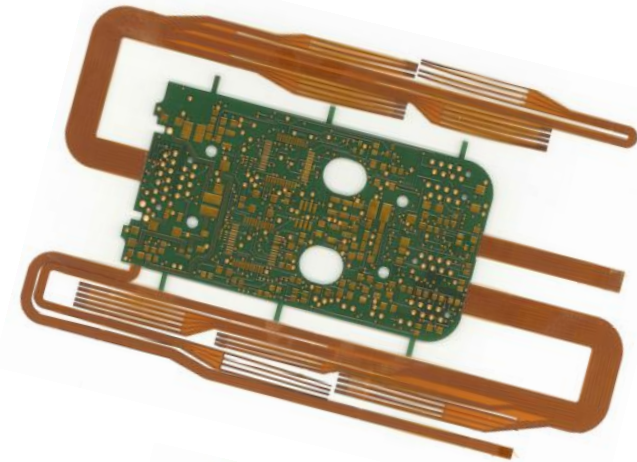
- Simulation of dynamic systems in Matlab/Simulink
- Filter and algorithm development
- Regulator and software prototyping for microcontrollers and DSP
- Simulation of drives and drive units



# Electronic services

## Hardware development

- Manufacturing of printed circuit boards
  - Circuit development
  - Circuit simulation
  - Layout generation
  - EMC compatible PCB layout
- Consulting for EMC issues
- PCB reviews
- Examples
  - Control electronics for motor applications
  - Power electronics up to 1kW
  - AC/DC and DC/DC switching power supplies
  - Safeguarding surveillance for high voltage applications
  - 8 - 32 bit micro controller and DSP electronics



# Electronic services

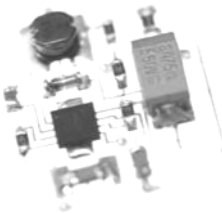
## Software development

- Software creation
  - Development according to internal or customer specified standards
  - Software development for micro controllers and DSP
  - Specialization in TI, ARM and microchip controllers
  - Interface programming
    - CAN, LIN, Profibus, Profinet, ...
- Execution of software reviews
- Consulting for software tests and test execution
- Creation of Windows™ based surfaces

# Electronic services

## Labview™ programming

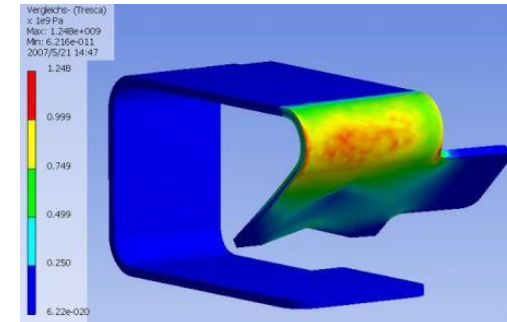
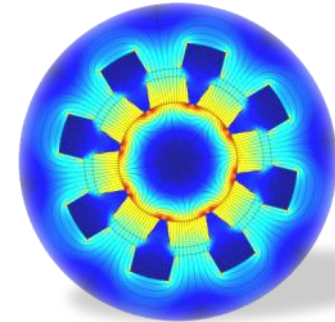
- Concepts and programming according NI- standards
- Execution of software tests and establishment of testing sequences
- Creation of substantial software for testing facilities
- Consulting for software concepts and programming
- Examples
  - Testing facilities for endurance testing and motors
  - Testing facilities for production
  - Automated facilities for dynamic material and component testing



# Simulation services

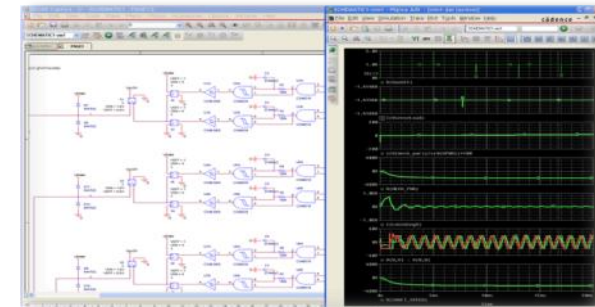
## Mechanics

- Structural mechanics optimization (Ansys)
- Magnetical optimization (Ansys)
- Multi-body simulation (LS-DYNA, Silux)
- Thermal simulations (Ansys, Matlab)
- Coupled systems (Ansys)



## Electronics

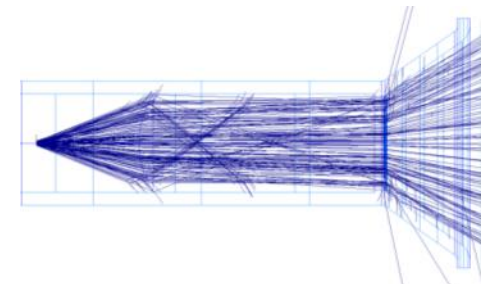
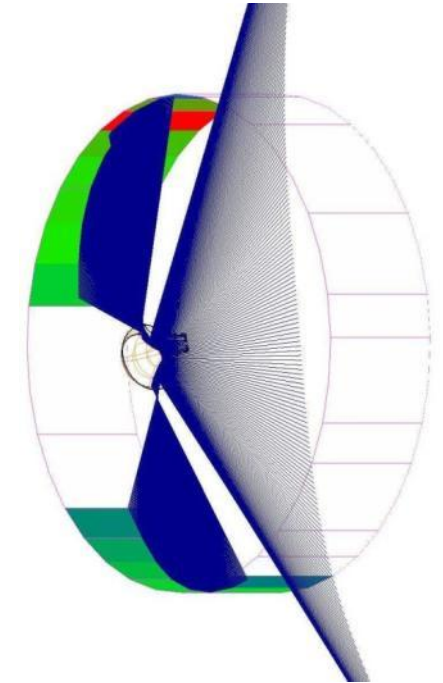
- Simulation of analogue circuits with PSpice
- System analysis with Matlab/Simulink



# Simulation services

## Optics

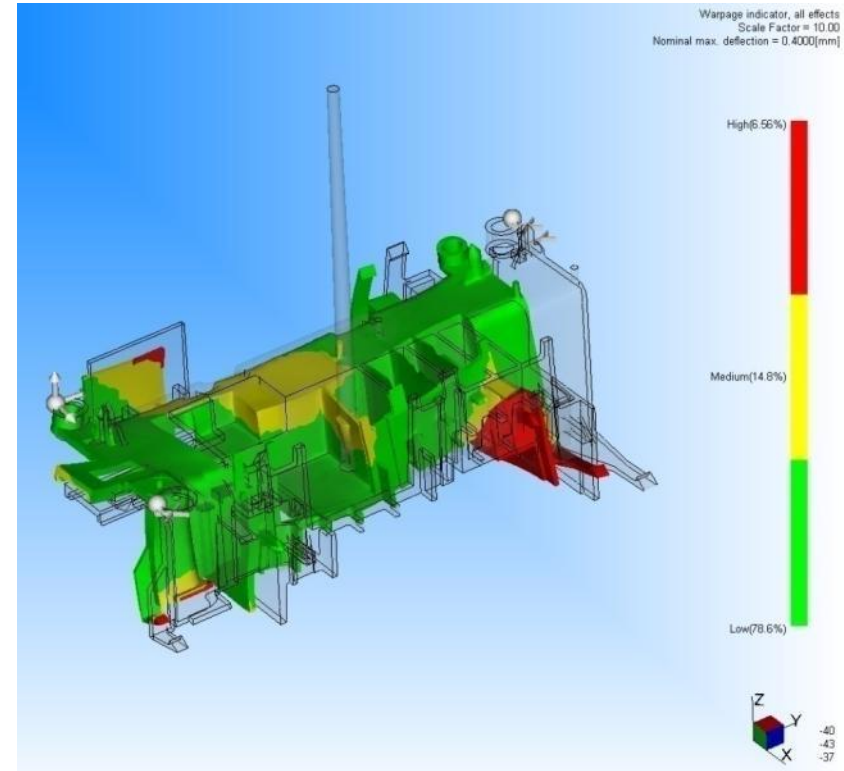
- Light source simulation
- Intensity distributions
- Simulation of scatter discs
- Optimization of optical systems in 3D
- Laboratory measurements of material parameters and light distributions



# Simulation services

## Polymer dye casting

- Form filling, joint lines
- Distortion and fibre orientation



# Services

## Manufacturing

- Ordering of tools
- Support for series transfer
- Support for manufacturing processes

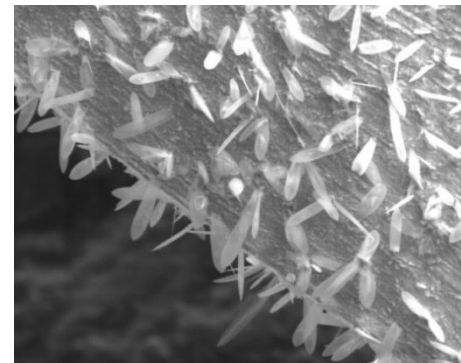
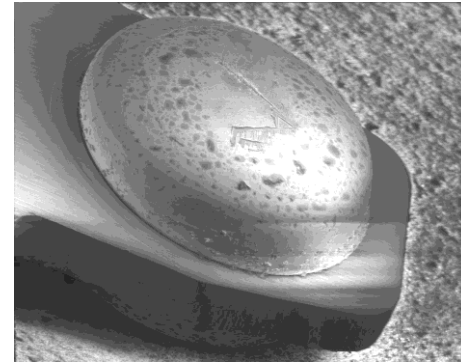
## Product update

- Optimizations
- Technical product support



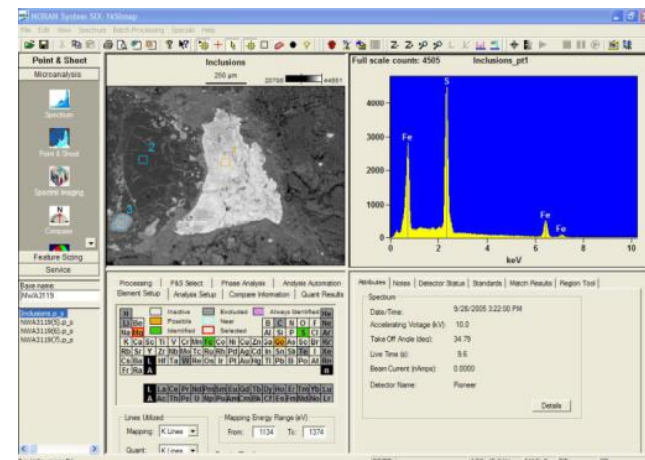
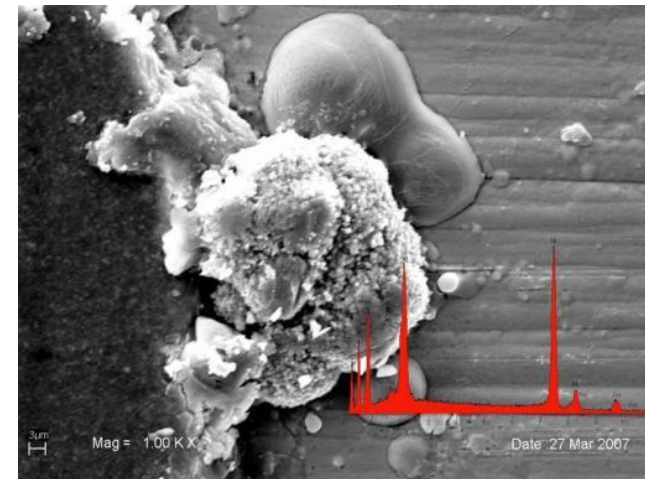
# Finest structures / surface details

- Zeiss DSM 950 digital scanning electron microscope
- Display of finest structures
- Zoom magnification up to 100'000x
- Resolution 4nm at 30kV, 25nm at 1kV acceleration voltage
- Spacious sample chamber with motorized sample stage
- Two detector types:  
Backscatter electron detector (surface morphology) and secondary electron detector (high magnification)



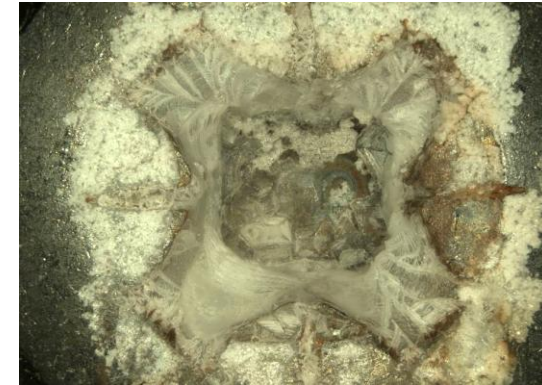
# Microanalysis

- State-of-the-art Thermo Scientific NORAN 7 system
- Analysis of surfaces, layers and particles
- Semiconductor detector (SiLi) 30mm<sup>2</sup>, polymer entrance window
- Element detection from carbon onward
- Energy resolution 149eV FWHM (Mn K $\alpha$ )
- Versatile software for spectrum acquisition and evaluation, automatic element recognition
- Overlay of electron microscope images and element maps

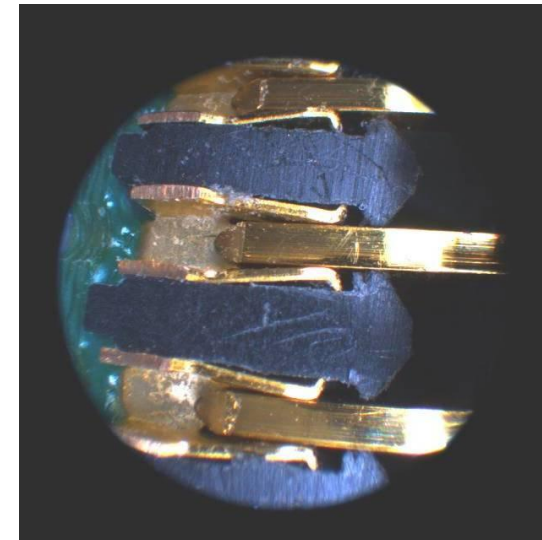


# Optical microscopy

- Stereo-microscope Leica MZ16 with digital camera Leica DFC320
- Expanded depth of focus up to 5mm based on software routine to combine several pictures layered in z-direction
- Optical evaluation of structures not readily accessible by using an endoscope
- Combination with digital SLR



high depth of field



# Vibrations and shocks

- Excitations: Sinus, noise, shocks, mixed modes, customer specific profiles
- Total sample mass up to 30kg at 16g
- Oscillation amplitude 50.8mm
- Frequency range 0Hz – 3000Hz
- Four analog input channels for control, measurement and surveillance
- Electrodynamic oscillation exciter, pneumatic load compensation
- Table diameter 340mm, horizontal and vertical orientation



	Nominal force (N)	Acceleration (g)	Velocity (m/s)
<b>Sinus</b>	6300	75	1.7
<b>Noise</b>	6300	75	1.7
<b>Shock</b>	12600	151	2.5

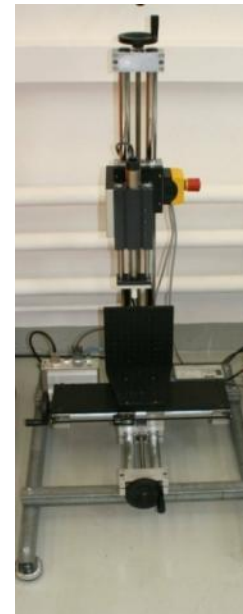
# Mechanical forces

- Force-travel-measurements (pull, push, hysteresis)
- Available measurement ranges: 50N - 1kN, 0 - 50N, class 0.5
- Maximum travel distance: 1100mm
- Testing velocities: 0.01 – 1000mm/min
- Travel resolution: 1µm
- Time synchronous video documentation of sample behaviour
- Rapid manufacturing of fixtures possible (toolshop in-house)
- Several inputs and outputs enable connections to other devices, e.g. to register electric switching points



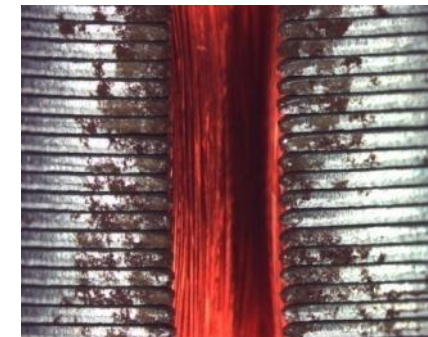
# Lifetime

- Lifetime testers for translation and rotation (integrated torque measurement)
- Lifetime testing with thousands of operational cycles
- PC-controlled, highly adaptable LabView software
- Max. Force 60N, max. torque about 50Nm at 900rpm
- Motional sequences can be defined within wide ranges
- Documentation of torque behaviour
- Rapid manufacturing of sample fixtures in our workshop



# Climate

- Climatic chamber Heraeus Vötsch VC 7020
- Climate simulations within a temperature range from 10 degrees C to 90 degrees C and humidities ranging from 10% to 98% r. h.
- Temperature tests from -70 degrees C to +180 degrees C
- Weathering setup for long-term tests
- Tests with multi-component corrosive gases in cooperation with our partners



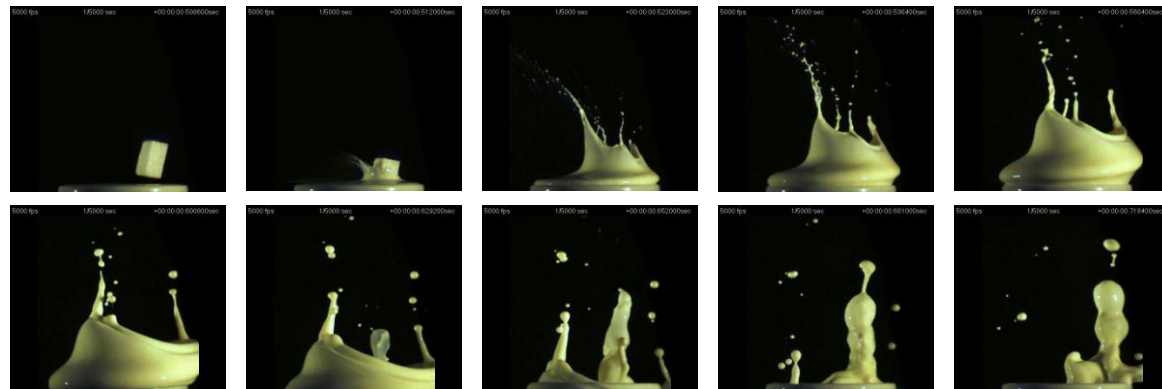
# IP-testing water jet (IPX9K)

- Testing with temperature-controlled high pressure water jet from different directions
- Pressure 8'000 – 10'000kPa, 80 degrees C, 14 – 16l/min
- Electric drives for nozzle movement and sample rotation
- Professional high pressure water jet ejector with temperature control
- High-volume boiler for increased testing durations
- Fully automated or manual testing sequence
- Max. sample dimensions (l x w x h): 350mm x 350mm x 400mm



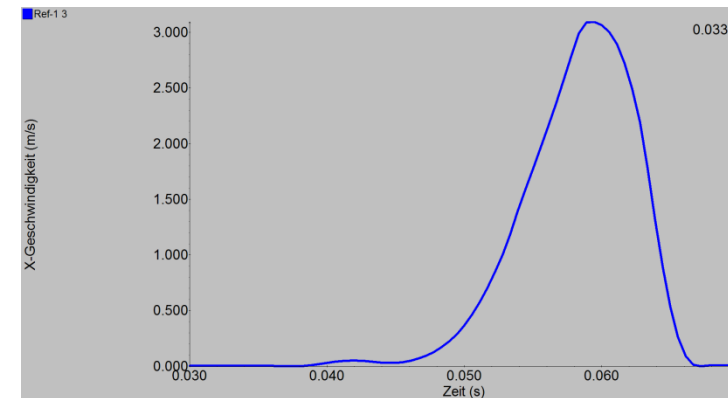
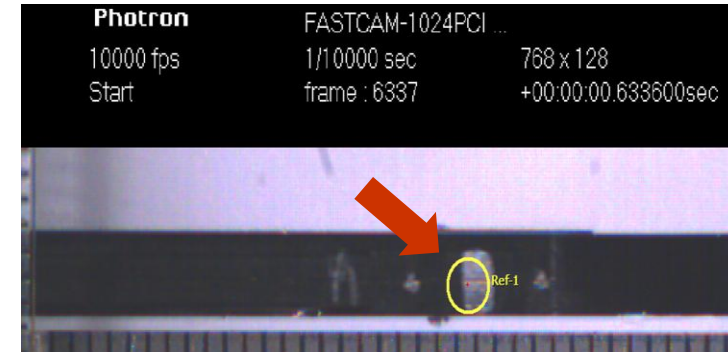
# Ultrafast processes

- Documentation of ultrafast processes
- PC-based mobile system
- Max. 109500 partial frames/s
- 1000 frames/s at full resolution (1024 x 1024 pixels)
- Shutter speeds up to 1.5µs
- Variety of lenses (standard, macro, zoom)
- Complete periphery (floodlights, tripods ...)
- System can be rented



# Kinematics

- Simi 2D software package
- Analysis of video-documented kinematic processes
  - Switching processes
  - Gear motions
  - Production sequences, e.g. stamping or ejection
- Automatic tracking of optical features in video recordings
- Graphical evaluation using x-t-, v-t- and a-t-diagrams
- Evaluation of high-speed video recordings possible



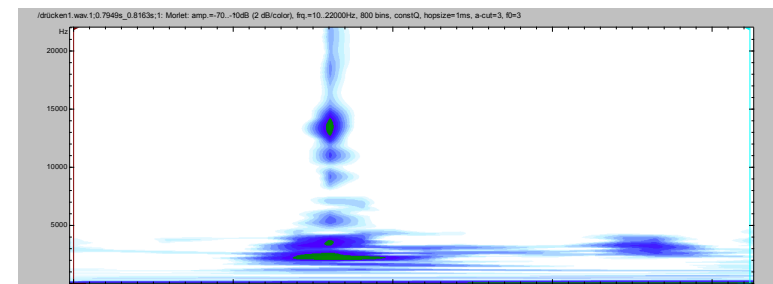
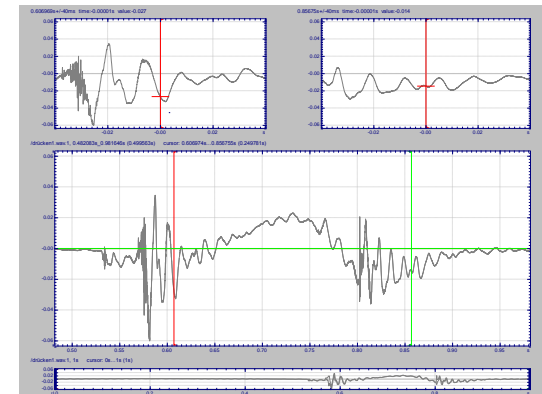
# Light intensity measurements

- System for space resolved photometric measurements of light intensity distributions
- Lightproof measurement chamber with motorized camera positioning and adjustable sample fixation
- Measurement range:  $0.002\text{cd/m}^2 - 120'000\text{cd/m}^2$
- Resolution: 1'280(horizontal) x 1'000(vertical) effective pixels
- Signal dynamics: 4'000 : 1 (single frame modus), up to 3'000'000 : 1 (repeated exposures)



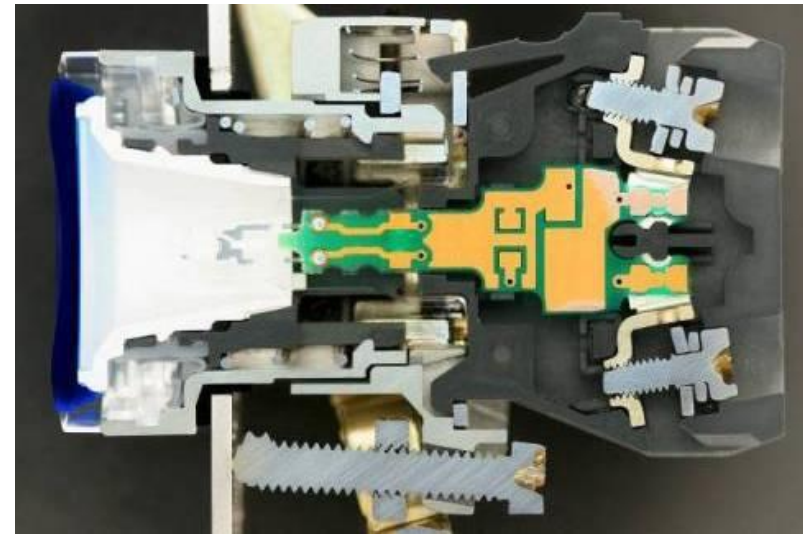
# Acoustic characterization

- High-quality monaural measuring chain (earthworks) and analysis software (STx )
- Anechoic measurement chamber with sample manipulators
- Documentation of acoustic signatures
- Measuring parameters: Sound frequency, relative sound intensity, time response
- Measuring range: 0 – 20kHz, signal duration nearly arbitrarily long
- Fast Fourier transformation (FFT)
- Wavelet analysis (amplitude and phase)
- Signal recording, replay and modification



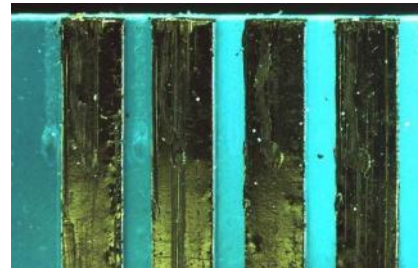
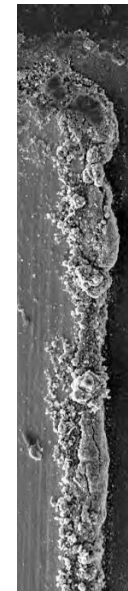
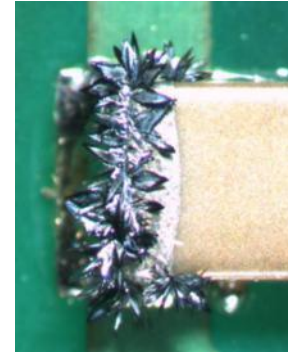
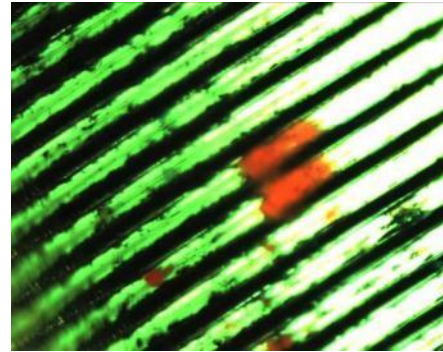
# Cross section method

- Bubble-free embedding of products or modules into highly transparent resin
- Precise orientation of cross section area
- Documentation of geometric sample state



# Damage and failure analyses

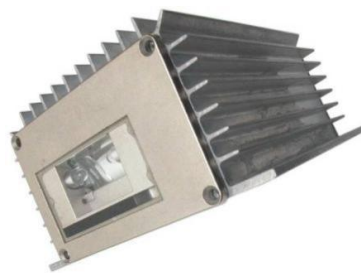
- Examinations and analyses of prototypes, complaint and production samples
- Areas of focus: Switches, relays, contact surfaces
- Cause studies in development, engineering, production processes and user environments



# References

We develop in different fields:

- Mechanics / precision engineering
- Electrical engineering
- Automotive engineering
- Medical technology



# Electronic services

## Drive engineering examples

- Power tools and household appliances
- Electronics for drives and generators in the area of locking technology
- Medical devices, e.g. pumps
- Automotive actuators
- Electromobility
  - Electric bicycles (EC-drive, sensorless)
- Automation technology
  - Compact drives for industrial applications
  - Interface programming
    - CAN, LIN, Profibus, Profinet



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