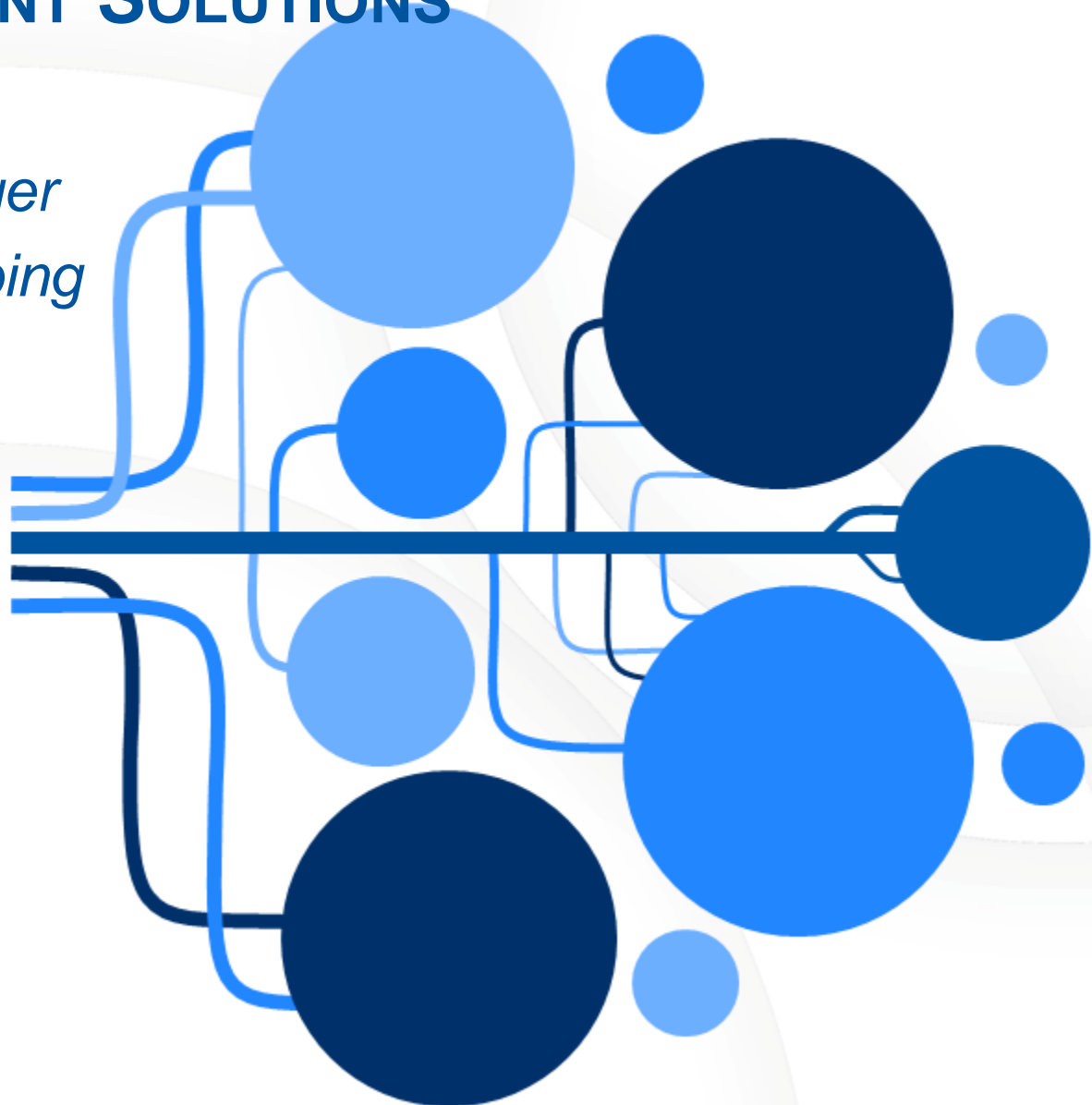


TACTILE PRESSURE AND FORCE MEASUREMENT SOLUTIONS

Camilo Aladro

Product Manager

Pressure Mapping



ABOUT TEKSCAN



- Privately held company, established in 1987
- Over 100 employees with global representation
- All manufacturing is done in Boston, MA at our ISO 13485 certified facility
- Innovation: We invest 14% of revenue on R&D & innovation
- Growth
 - Tekscan has earned a ranking on the Inc. 5000, the business magazine's annual listing of the fastest-growing private companies in America
- Solid financial ground/no debt
 - Choosing Tekscan as your business partner, is a smart and solid investment



EXPERTISE

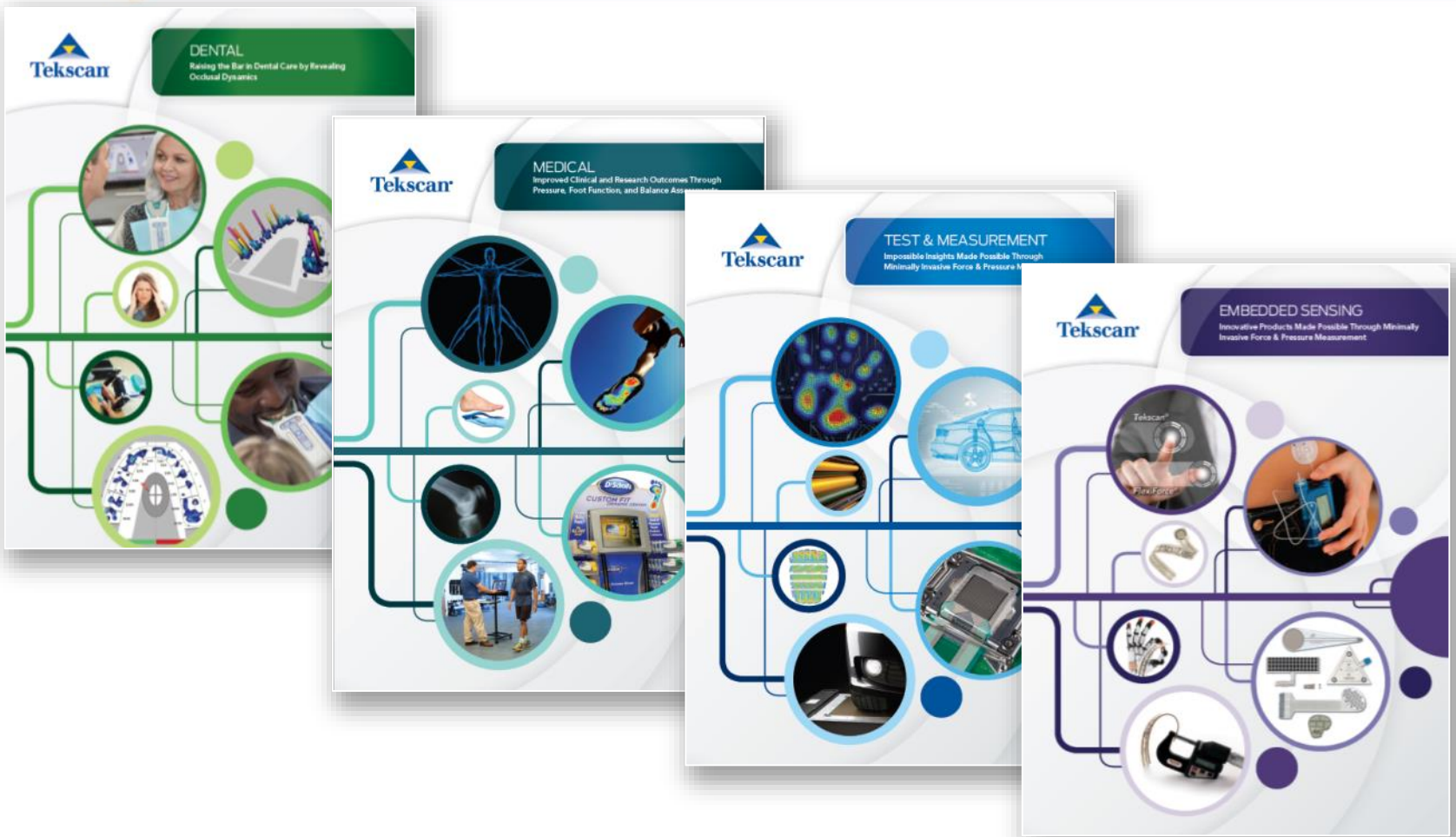
- Tekscan has subject-matter experts in R&D, manufacturing, application engineering, as well as in biomechanics and dentistry
- We have a large team of mechanical designers, software engineers & electrical engineers with a proven track record of exceptional results



MANUFACTURING, PRODUCT DESIGN, FORTUNE 500, ACADEMIA

WHERE YOU WILL FIND US

BUSINESS UNITS



DENTAL – IMPROVED DENTAL CARE



- Dentistry's only digital occlusal analysis system
- Reveals the level and timing of force on individual teeth and the occlusal stability of the overall bite
- Brings objectivity to articulating paper
- Used in all facets of dentistry

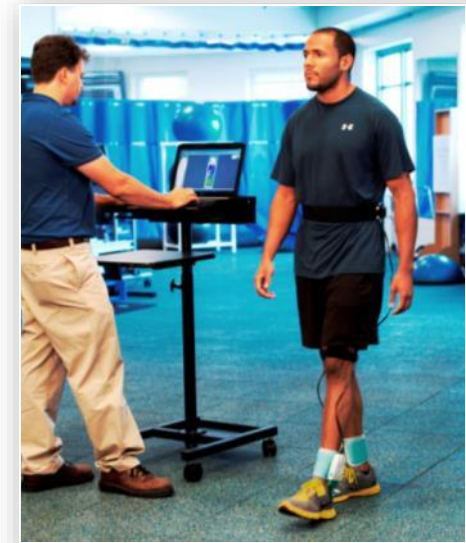
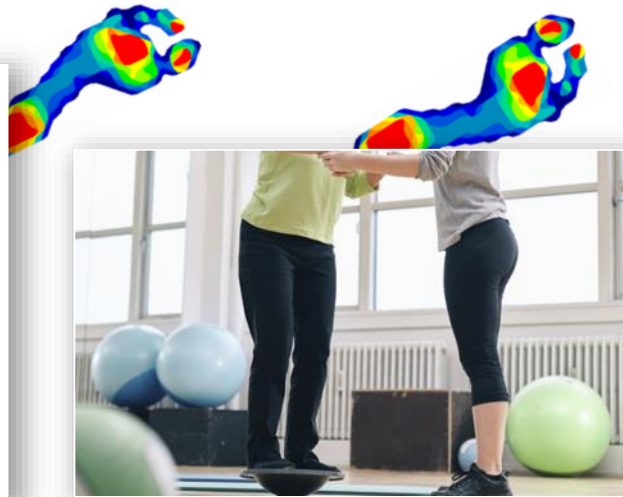
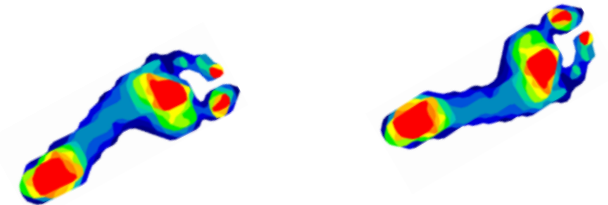


MEDICAL – IMPROVED CLINICAL & RESEARCH EVALUATIONS



Tekscan technology is widely used in the medical field to measure:

- Gait analysis
- Balance & stability assessment
- Pressure offloading for wounds/ulcers
- Clinical seat & cushion assessment

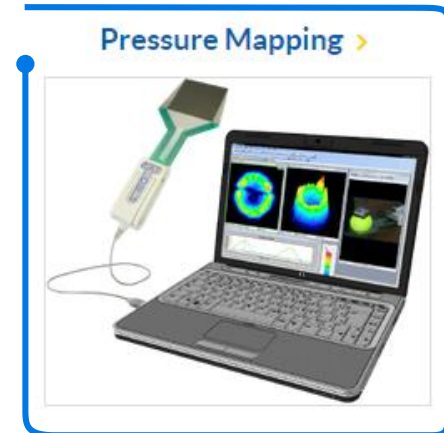


TEST & MEASUREMENT – PROVIDING INSIGHT



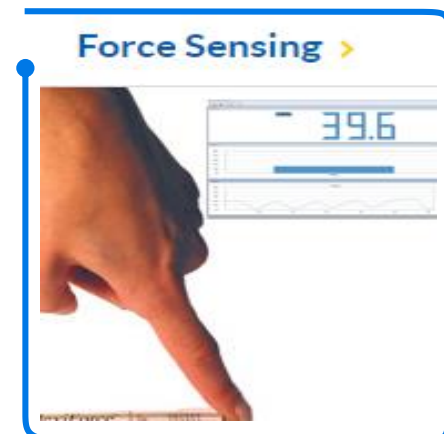
Pressure Mapping

- Data you can't get anywhere else by accurately measuring and analyzing interface pressure between two surfaces
- Automotive, ergonomics, electrical components/semiconductors, printing/packaging, tire, web/converting



Force Sensing

- FlexiForce sensors economically measure load and force between two surfaces utilizing a minimally invasive form factor
- Control & diagnostic tools



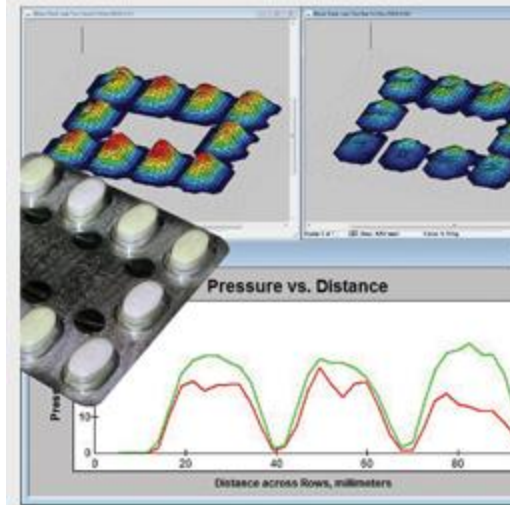
EMBEDDED SENSING – INNOVATIVE PRODUCTS



Custom Force Sensors



Pressure Mapping



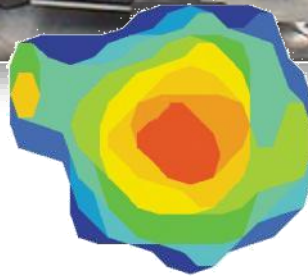
MEDICAL DEVICES, INDUSTRIAL CONTROLS, ROBOTICS, SPORTS
AND FITNESS, MACHINE SETUP & CONSUMER ELECTRONICS

PRESSURE MAPPING

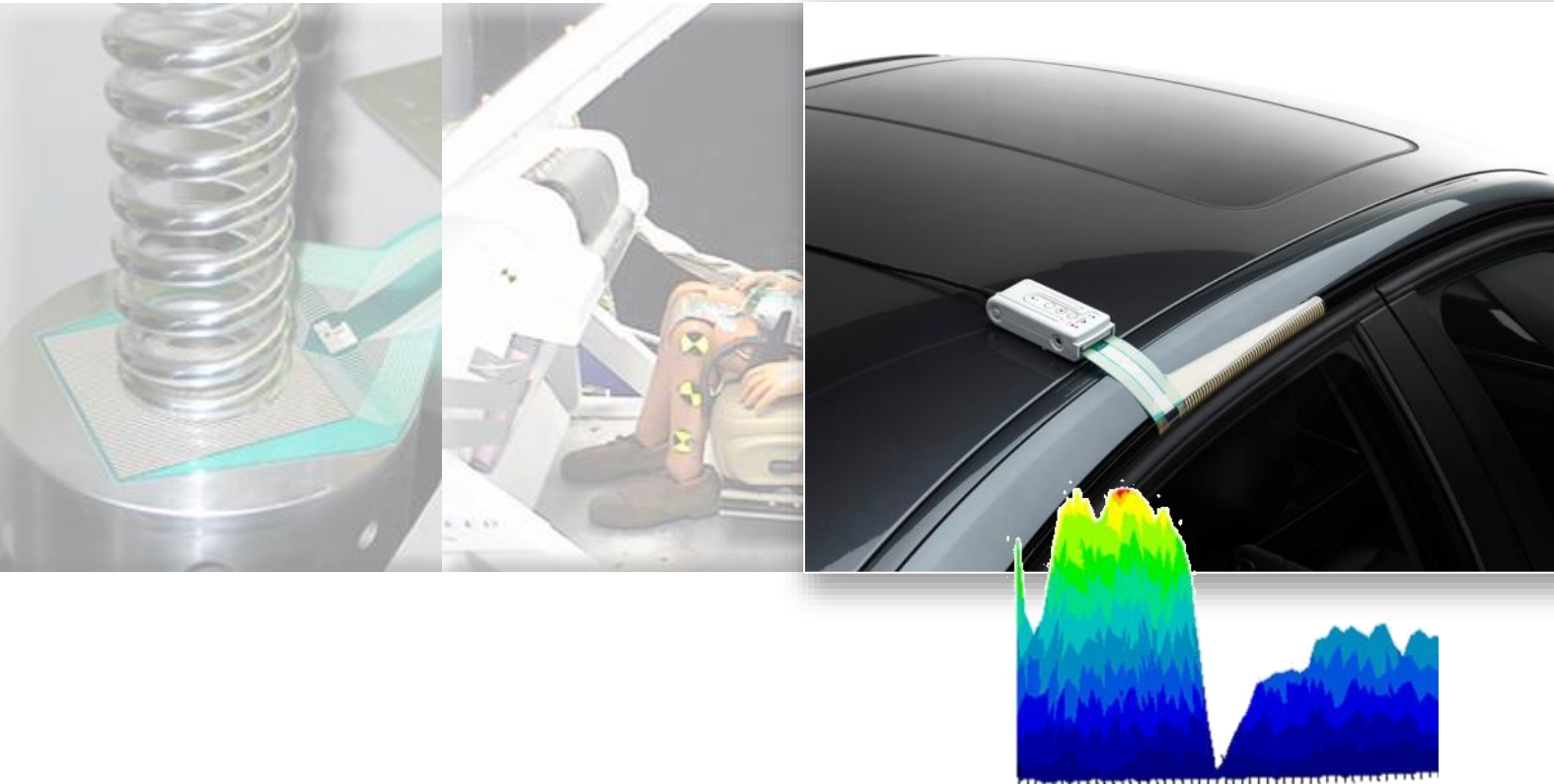
Test & Measurement



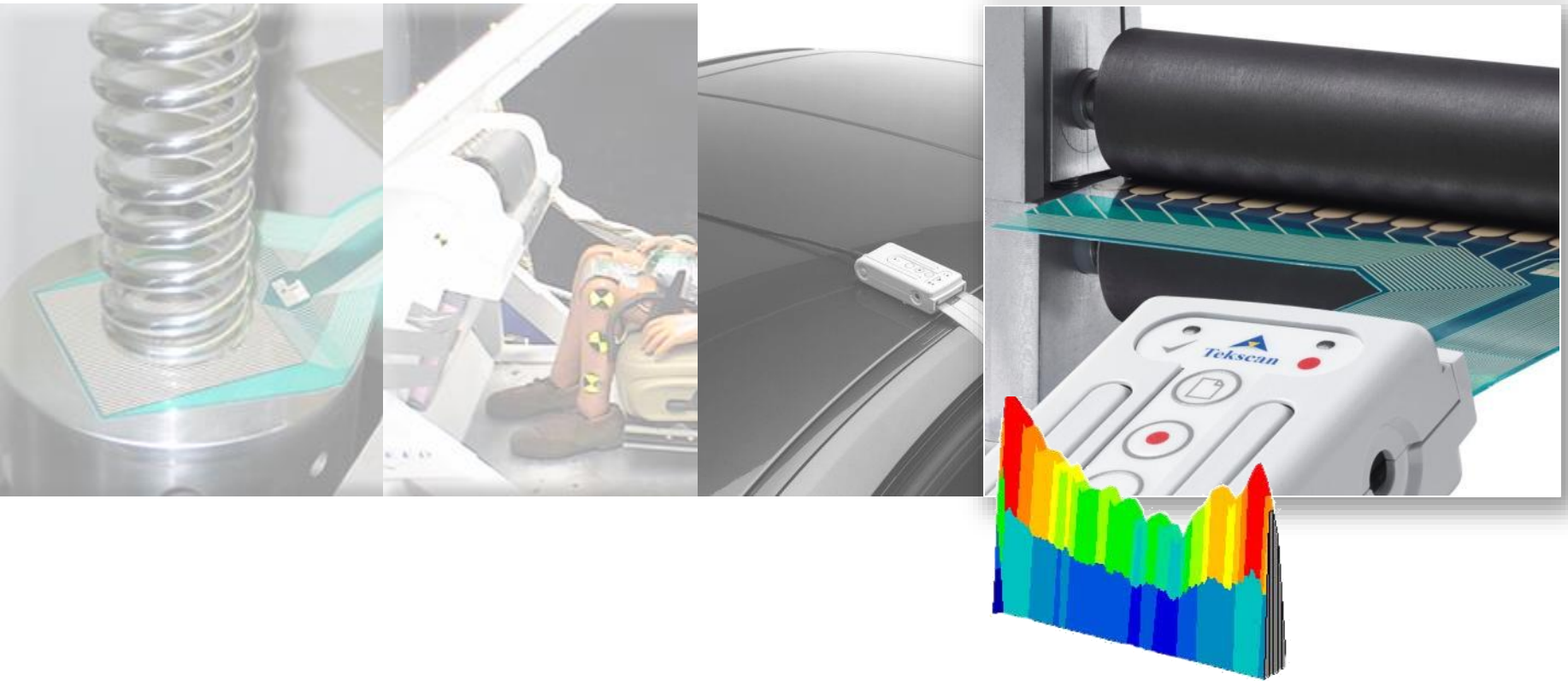
Research & Development



Quality Assurance



Machine Setup



Integrated Pressure Mapping Technology



PRESSURE MAPPING IN R&D

Optimize product development:



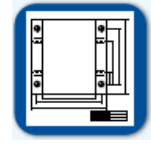
Prototyping



Ergonomics and comfort



Verifying material selection



Improving & validating the finite element analysis model



Examining snap fits on parts or seal on connectors



Competitive benchmarking



Analyzing drop testing impacts

Improve manufacturing procedures:



Standardizing alignment of parts



Confirming success of a procedural adjustment



Testing precision of robot manufacturing



Quality control/quality review



Confirming an operational cost savings

SYSTEM COMPONENTS

SENSOR



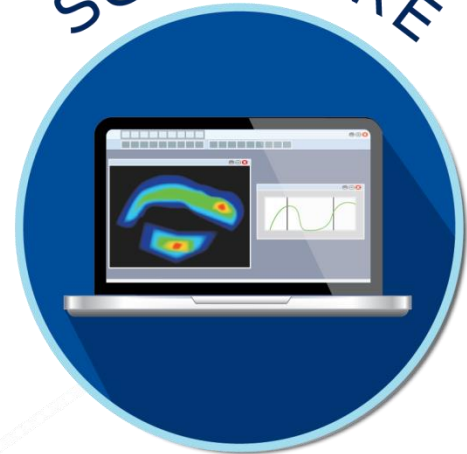
- Minimal invasiveness
- High resolution
- Thin & flexible

ELECTRONICS



- Scans thousands of sensing points within each sensor
- Instant data relay to PC via USB or WiFi

SOFTWARE



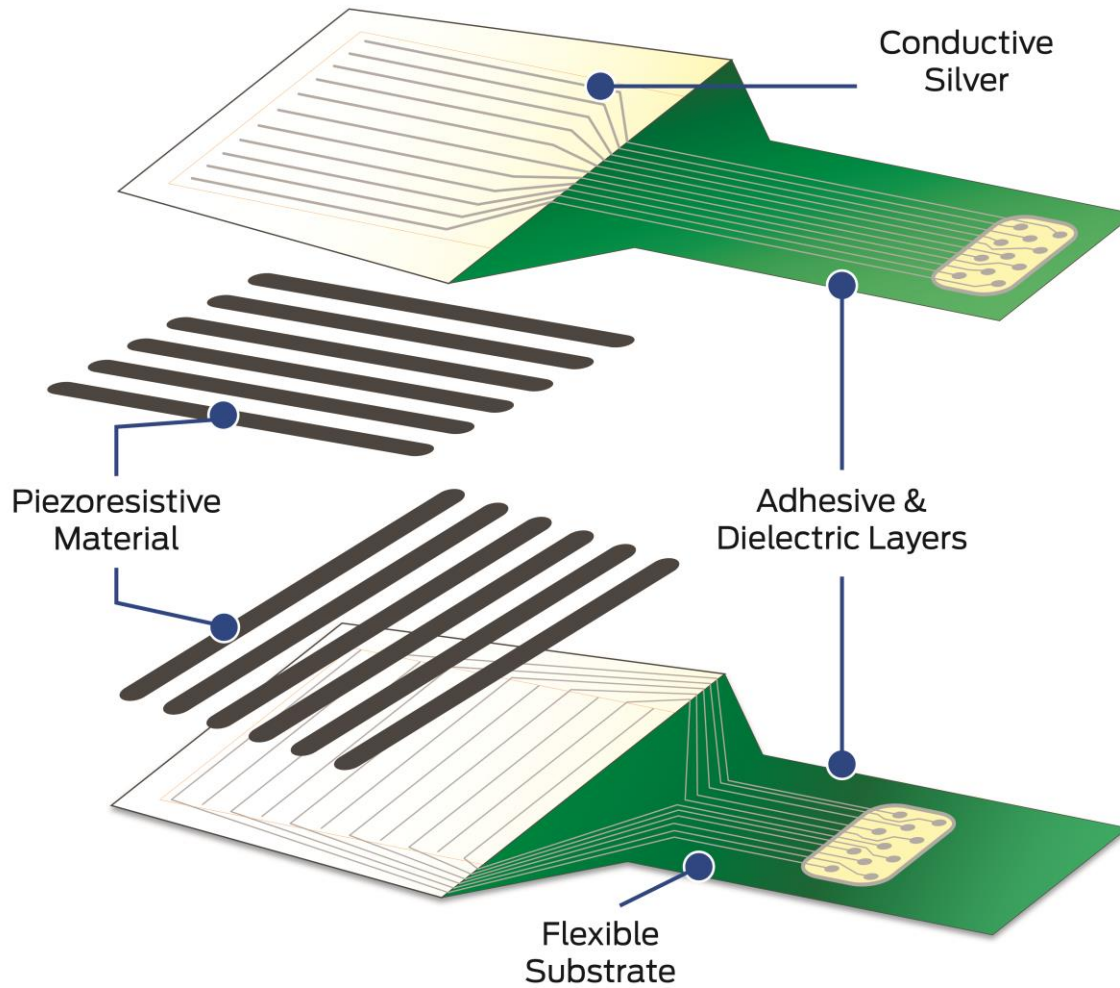
- Display pressure distribution data in multiple formats for superior analysis
- Display pressure data graphs in 2D & 3D
- Capture peak pressures and center of force in real time
- Allow for video playback of pressure data

SENSORS

- Flexible, thin film tactile pressure sensors
 - Available in different sizes, shapes, resolutions, temperature ratings, and pressure ranges
- High spatial resolution
- Range of sensing areas
- Consistent & repeatable data
- High-temperature sensors
- Custom sensors



SENSOR CONSTRUCTION

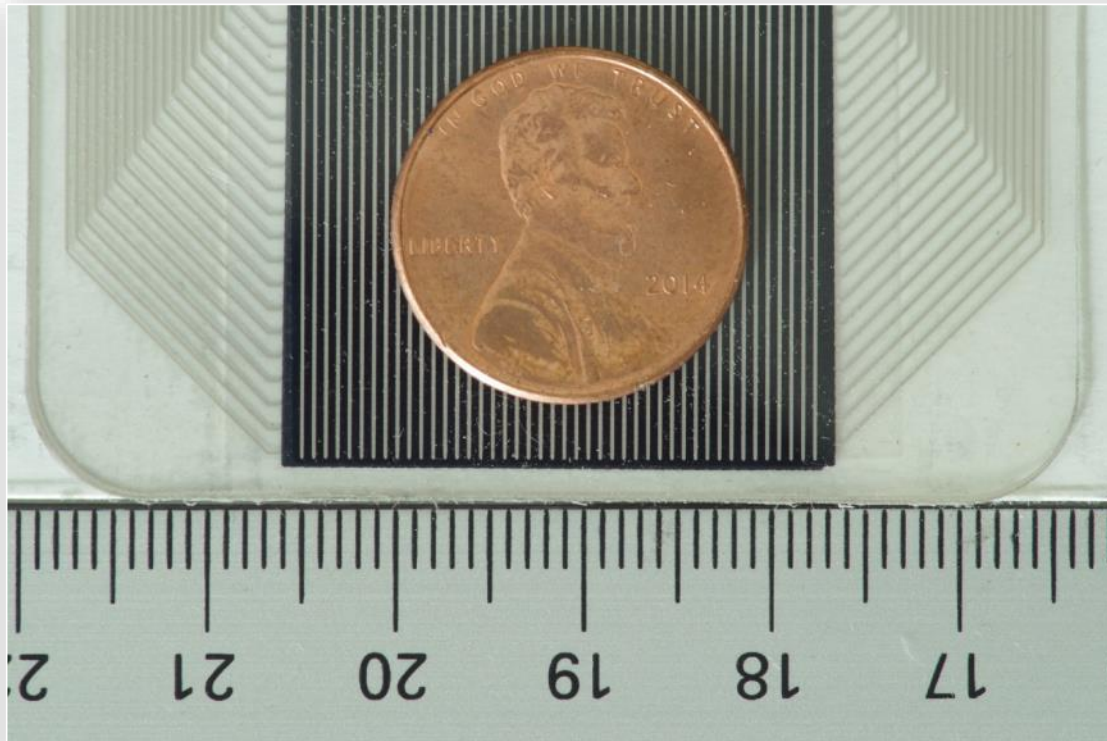


PAPER-THIN & FLEXIBLE

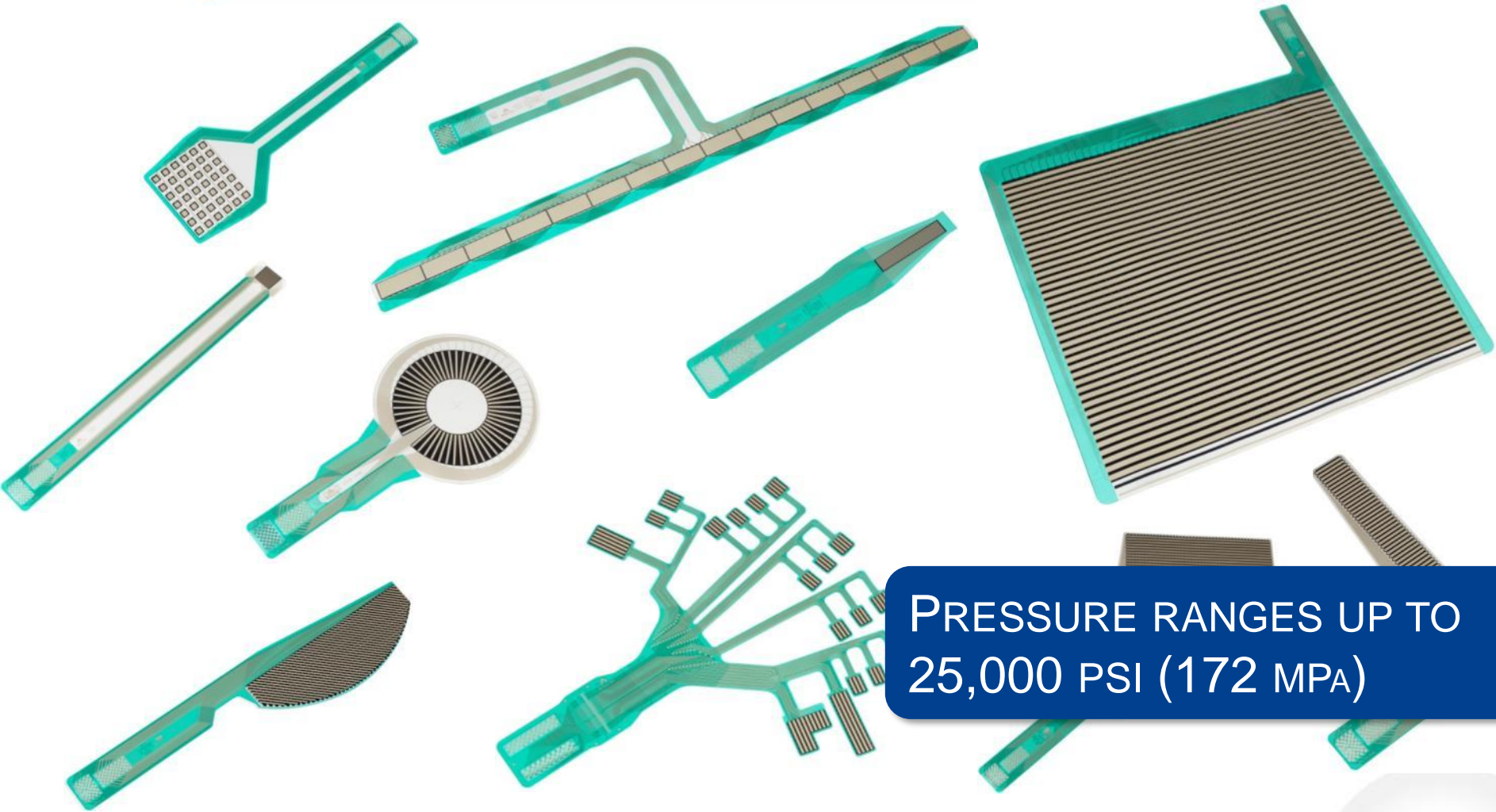


HIGH SPATIAL (X,Y) RESOLUTION

- Up to 248 sensing elements/cm² (1,600 sensing elements/in²)
- Element spacing (pitch) as narrow as 0.64 mm (0.025 in.)

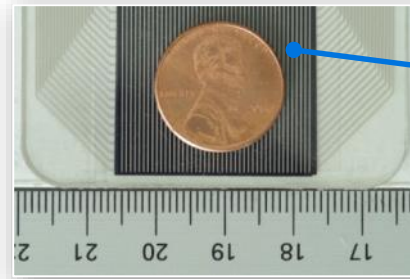
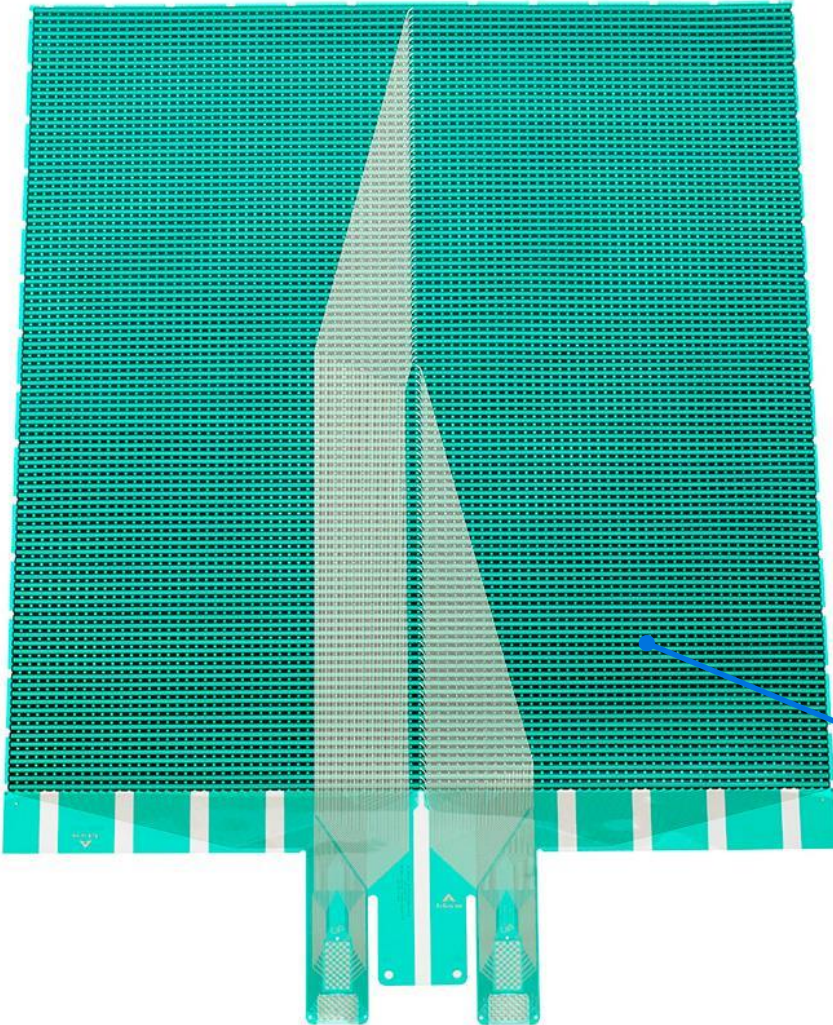


VARIETY OF SENSOR CONFIGURATIONS



PRESSURE RANGES UP TO
25,000 PSI (172 MPA)

RANGE OF SENSING AREAS

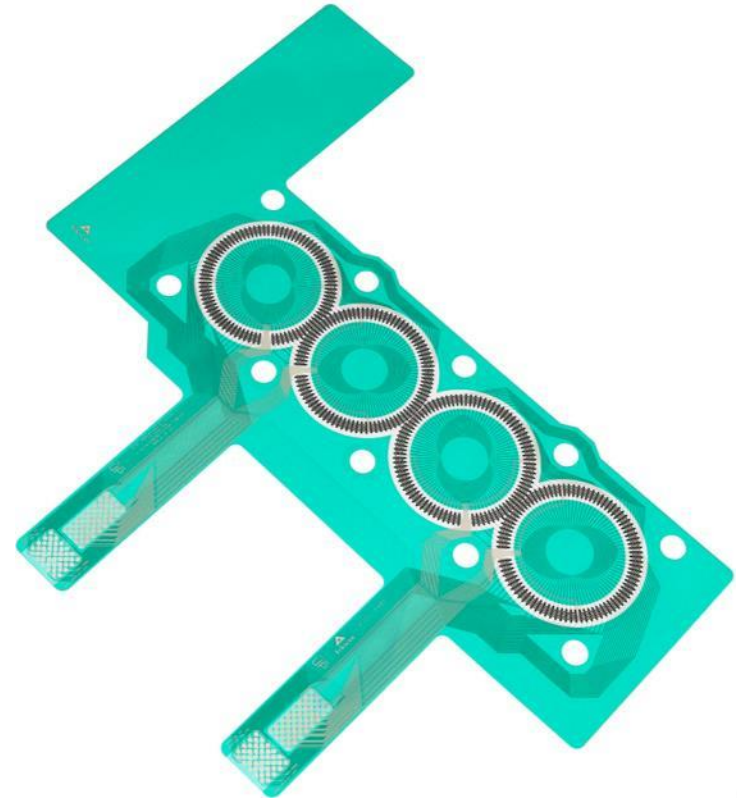
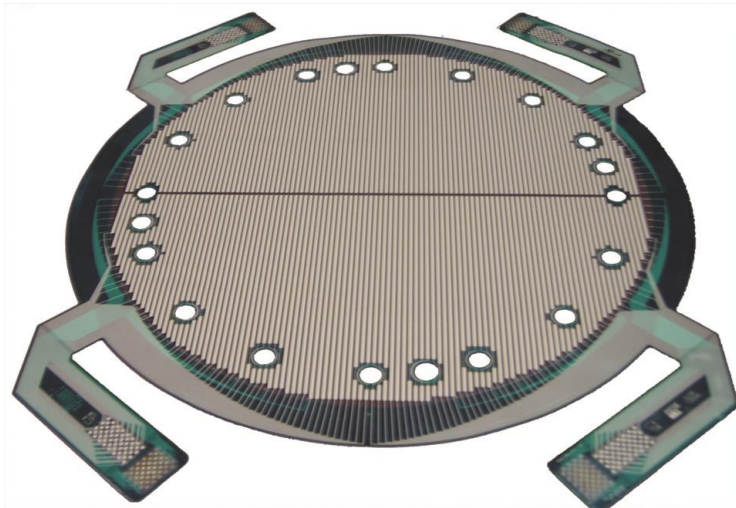


27.9 mm x 27.9 mm
(1.1 in. x 1.1 in.)

704.1 mm x 625.9 mm
(27.72 in. x 24.64 in.)

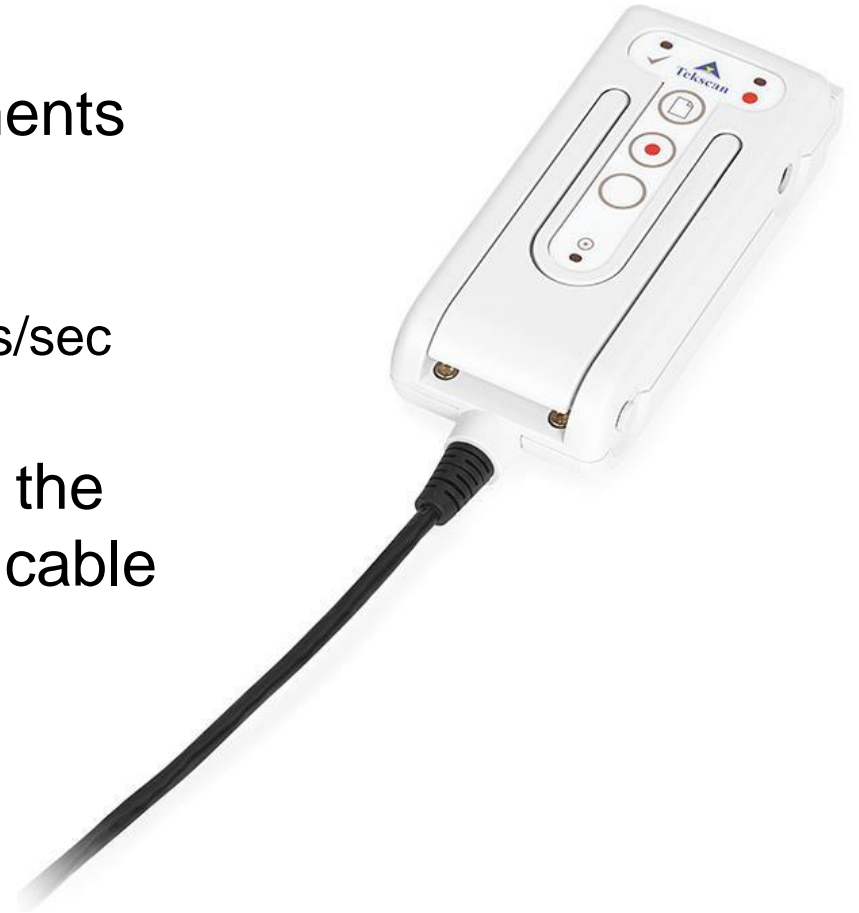
CUSTOM SENSORS

- Fully customized sensors can be manufactured to meet any application



DATA ACQUISITION ELECTRONICS

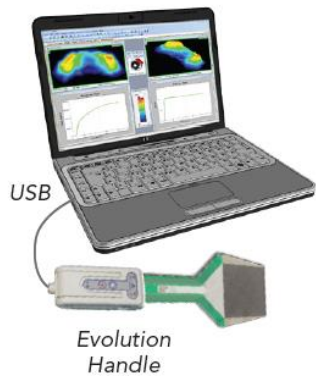
- Obtain pressure data by scanning the sensing elements within each sensor
 - Up to 1,600,000 sensing elements/sec, 20,000 frames/sec
- Data is instantly relayed to the software on a PC via USB cable



CONFIGURATIONS

Evolution®

STANDARD USB
Up to 100 Hz



For use in standard applications.

VersaTek®

HIGH SPEED USB
Up to 20,000 Hz



For use in high-speed applications or for sensors with higher resolution over large areas.

Wireless

VERSATEK® WIRELESS UNIT
Up to 4,600 Hz



Wirelessly transmit data to PC for remote data collection (up to 100m).

Datalogger

VERSATEK® DATALOGGER UNIT
Up to 20,000 Hz

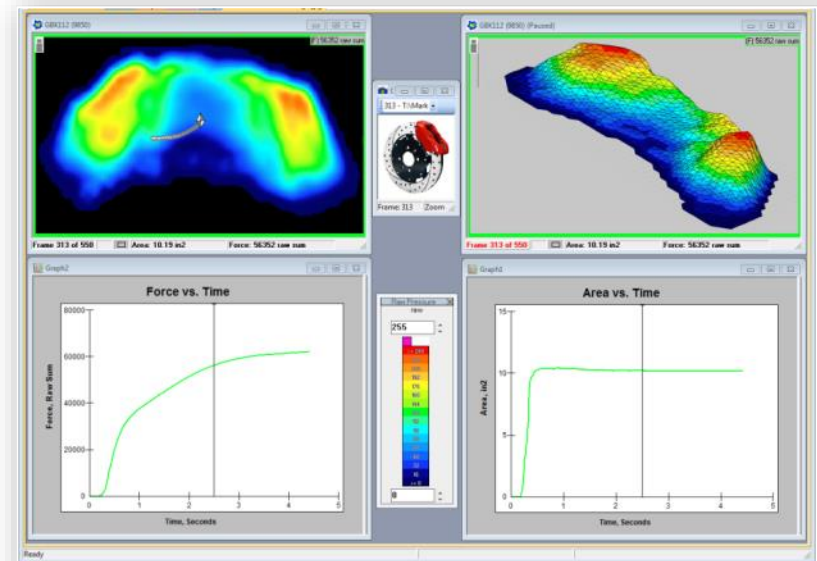


Collect data onto Datalogger Unit and upload to PC after data collection. For wireless use at higher speeds & noisy environments.

SOFTWARE

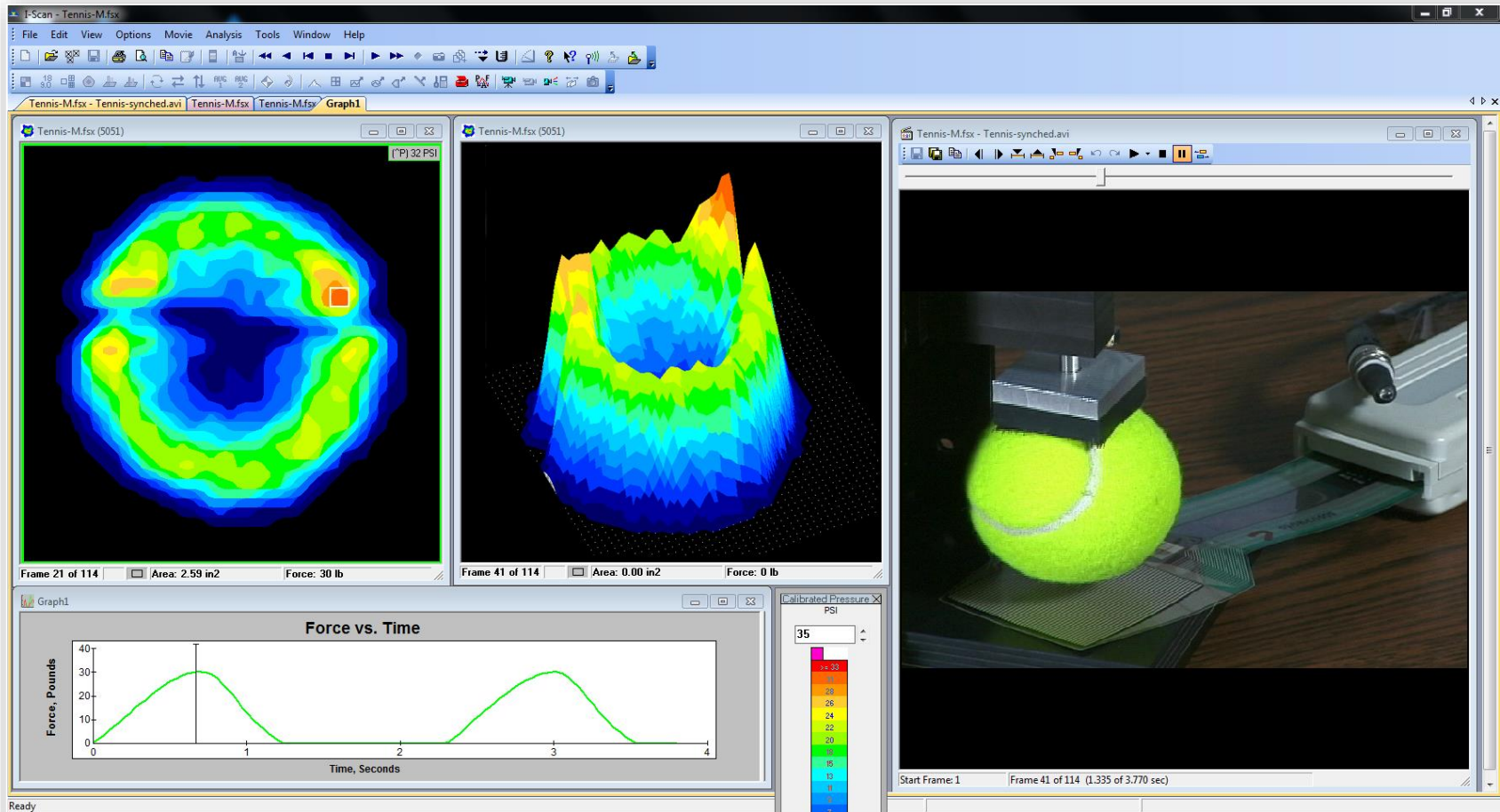
Key Features

- 2D, 3D, and contour pressure image views
- Graphing & data analysis (pressure, force, & area)
- View data as an integrated Microsoft Excel table
- View and compare multiple test results simultaneously
- Display peak pressures & center of force
- Export data to ASCII or AVI files

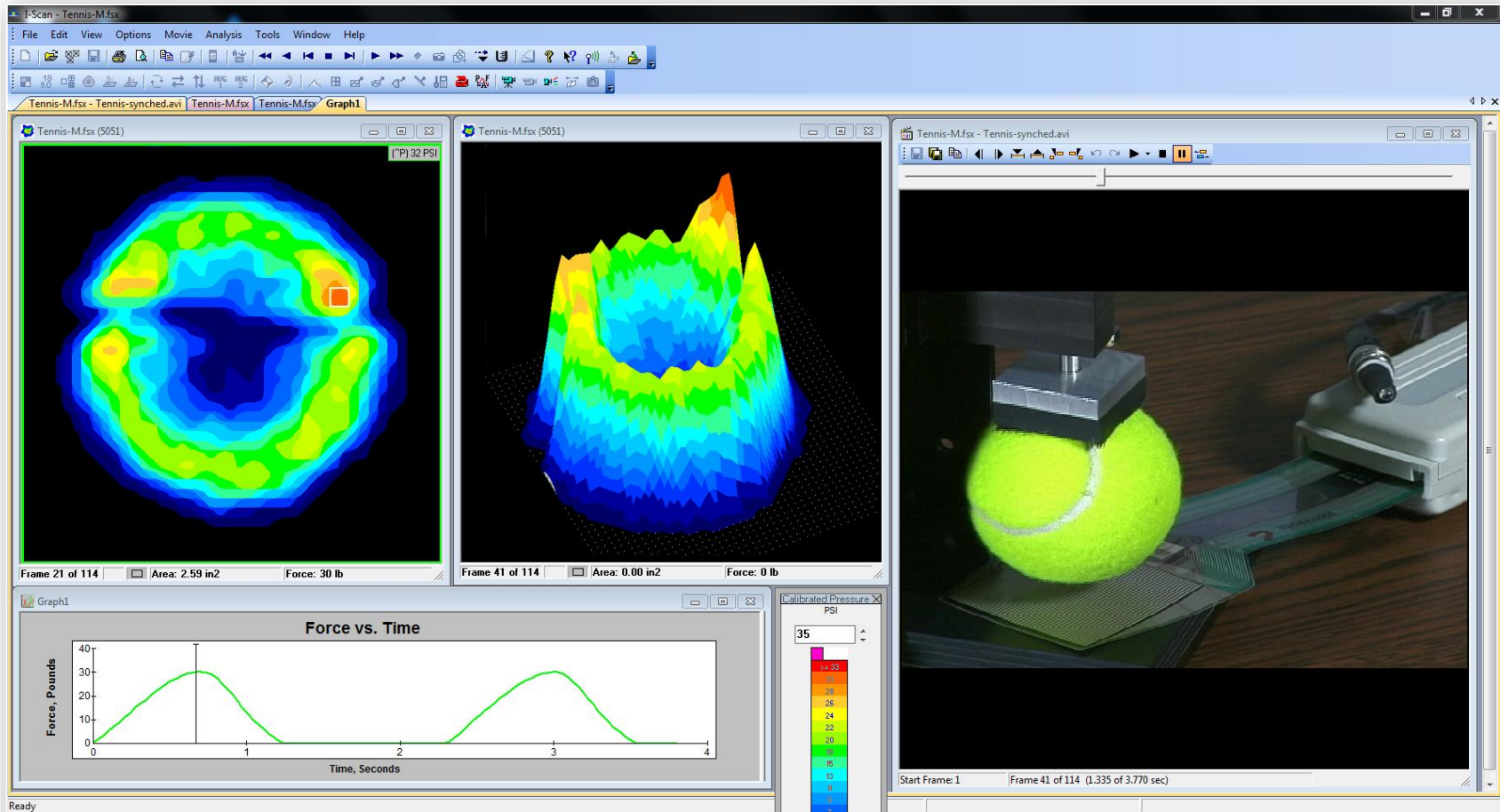


Data and imagery of the pressure distribution display in real time with the ability to record, play back, and save

SOFTWARE



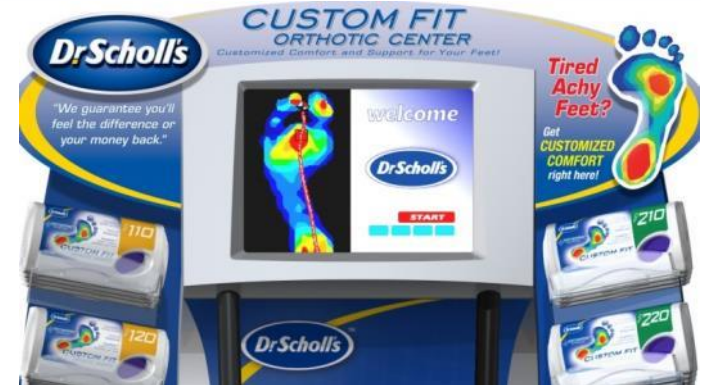
SOFTWARE



SOFTWARE CAPABILITIES

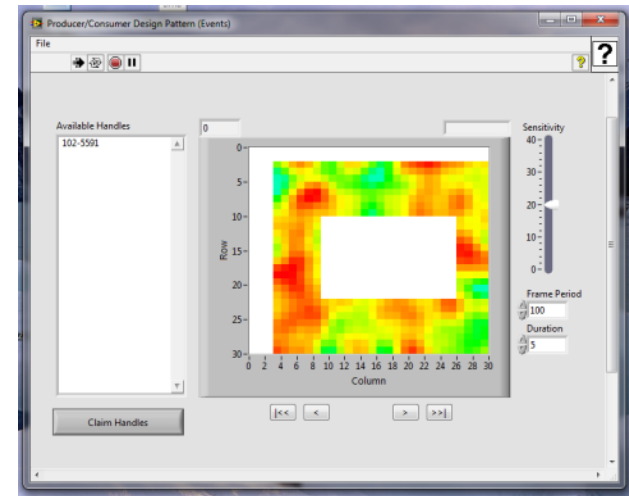
Custom Software

- Tekscan's software development team can create a customized UI to display pressure mapping in a windows environment



Software Development Kit (SDK)

- Application Programming Interface (API), which allows you to access the functionality of Tekscan's pressure mapping system for integration with your equipment and software. The function calls provide direct communication with Tekscan electronics.



SYSTEM OFFERINGS



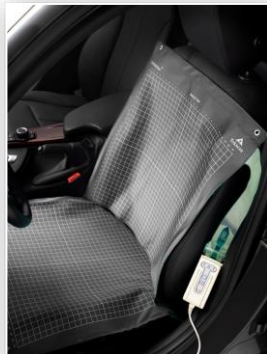
I-Scan™



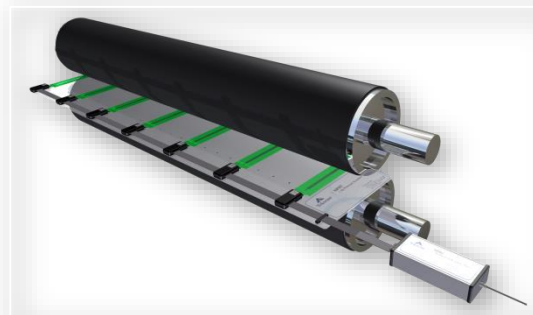
TireScan™



Grip™



BPMS™



NPAT™



Wiper™

APPLICATIONS

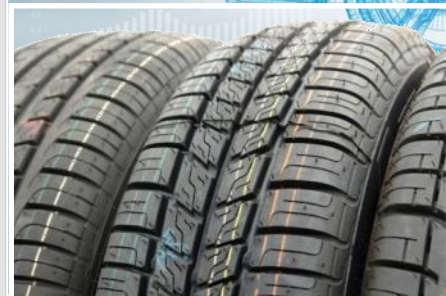
AUTOMOTIVE APPLICATIONS



Gaskets



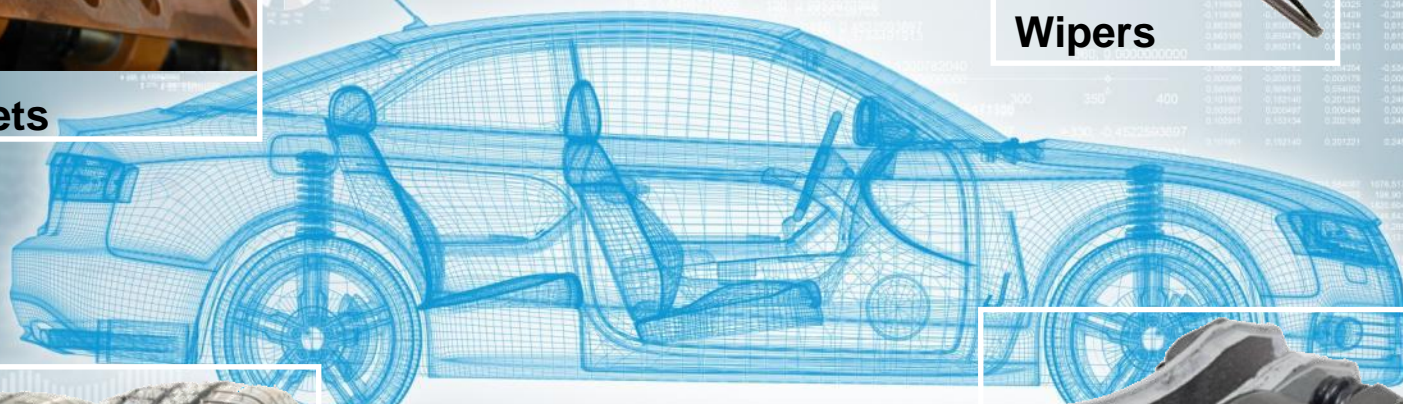
Wipers



Tires



Brakes



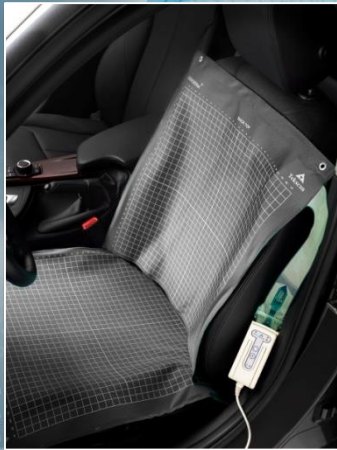
AUTOMOTIVE APPLICATIONS



Door/trunk seal



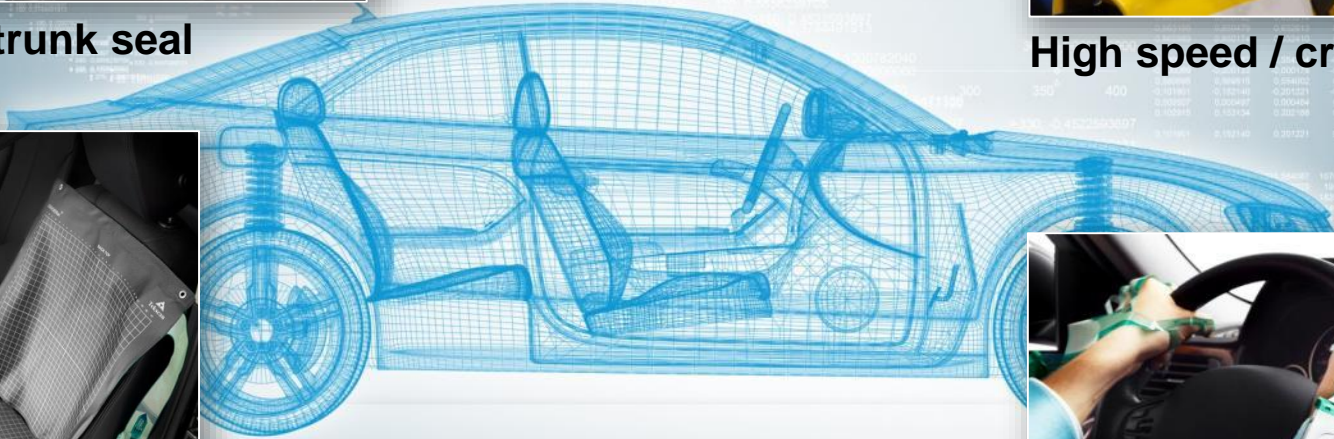
High speed / crash



Seating



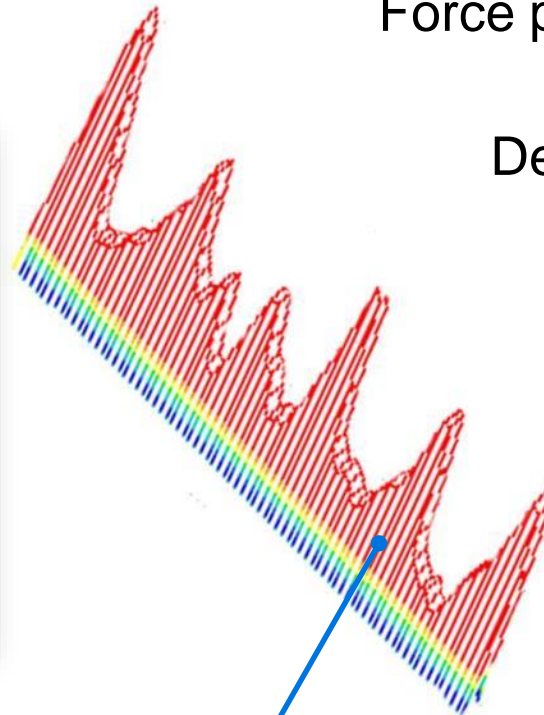
Ergonomics



WINDSHIELD WIPER BLADE FORCE PROFILE



Wiper sensor



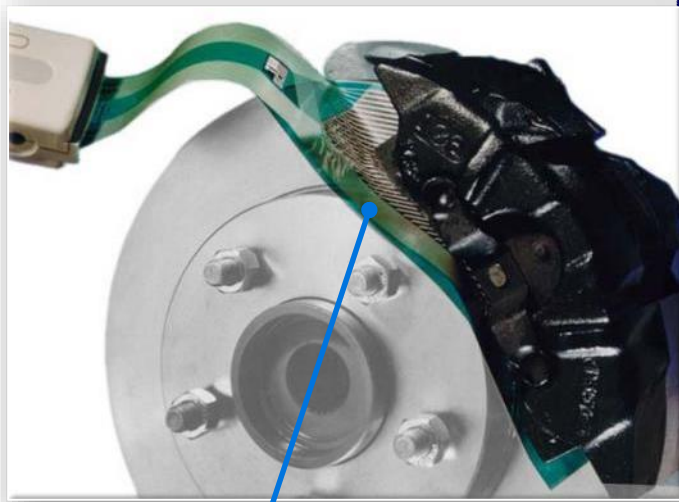
Wiper display

Force profiling

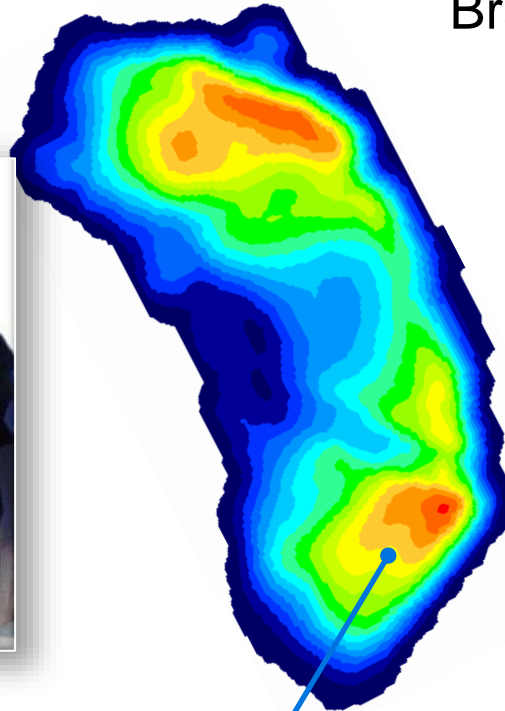
Design verification

Reliability testing

BRAKE PRESSURE PATTERNS



Brake sensor



Brake display

Brake design

Wear patterns

Vibration testing

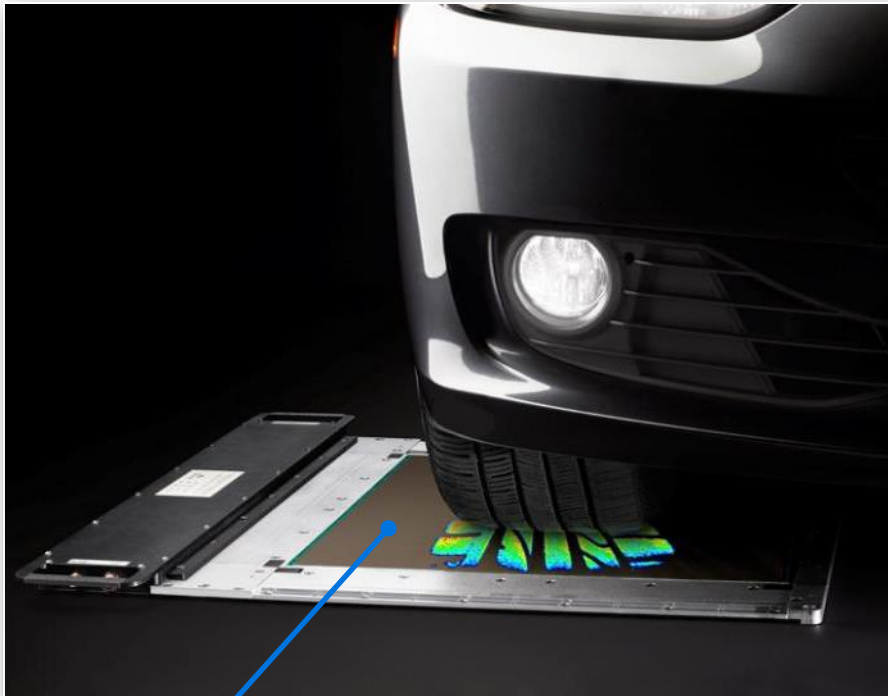
TIRE FOOTPRINT ANALYSIS

Vehicle suspension analysis

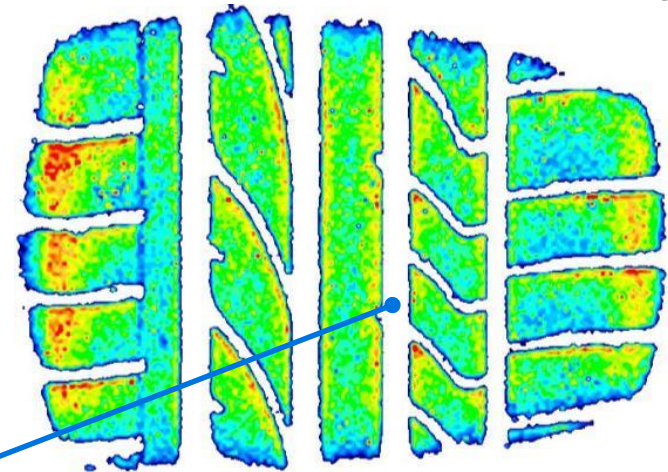
Soil disturbance testing

Quality assurance

Tread design



Tire sensor



Pressure display

TIRE FOOTPRINT ANALYSIS

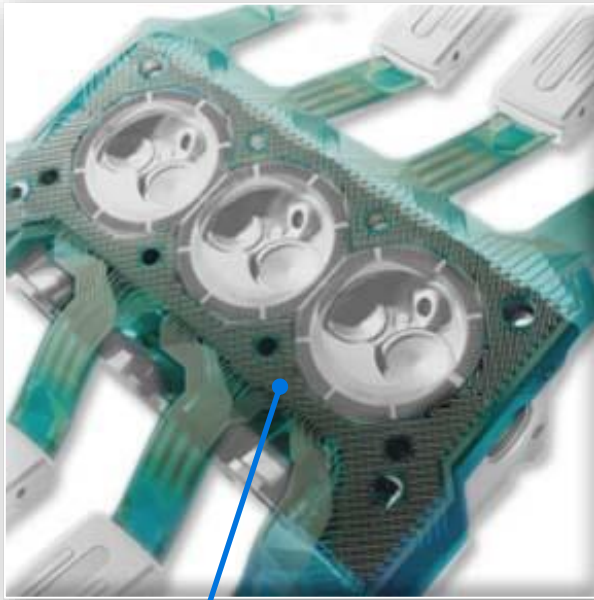


GASKET DESIGN

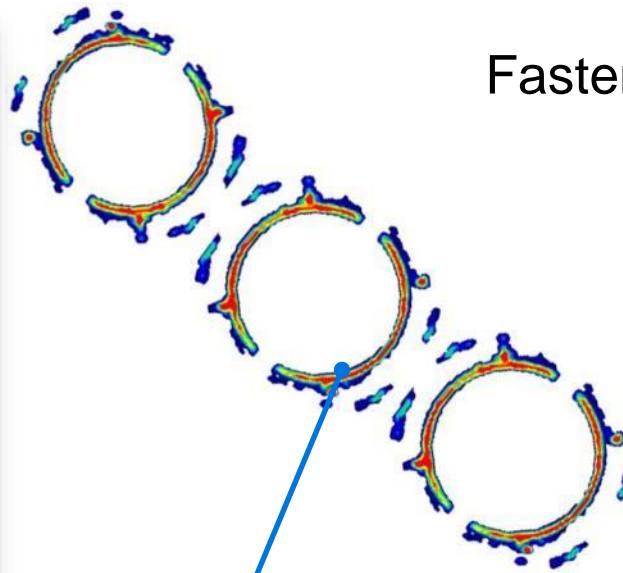
Engine seal evaluation

Fastener selection

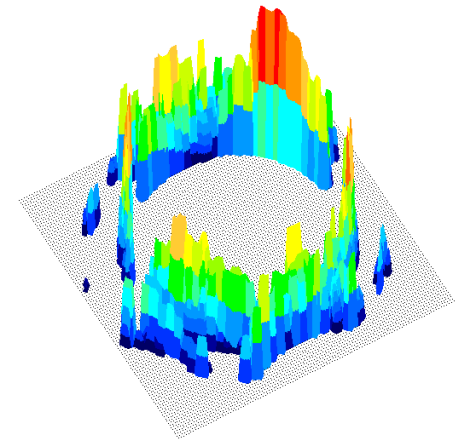
Torque pattern



Gasket sensor

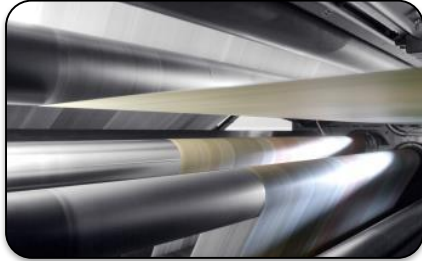


Gasket display



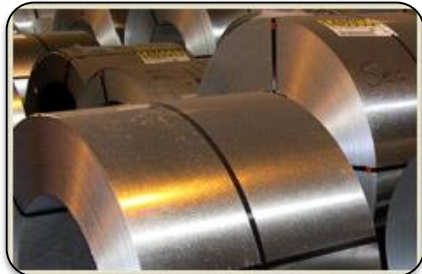
NIP/ROLL

NIP/ROLLER APPLICATIONS



Printing

- Pull Rollers
- Tension Rollers



Metal Mills

- Iron, Steel, Copper, etc.
- Coasters



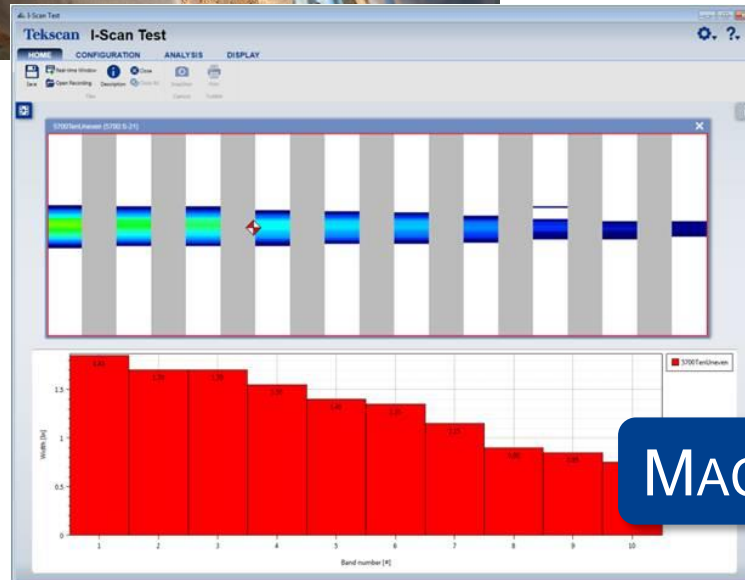
Packaging

- Laminators & Converters
- Die Press

NIP/ROLLER APPLICATIONS

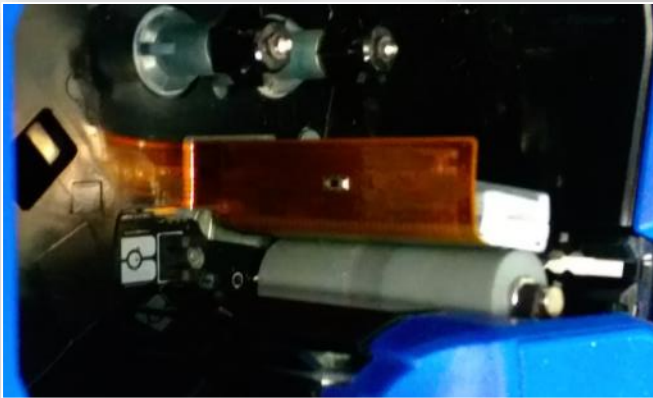
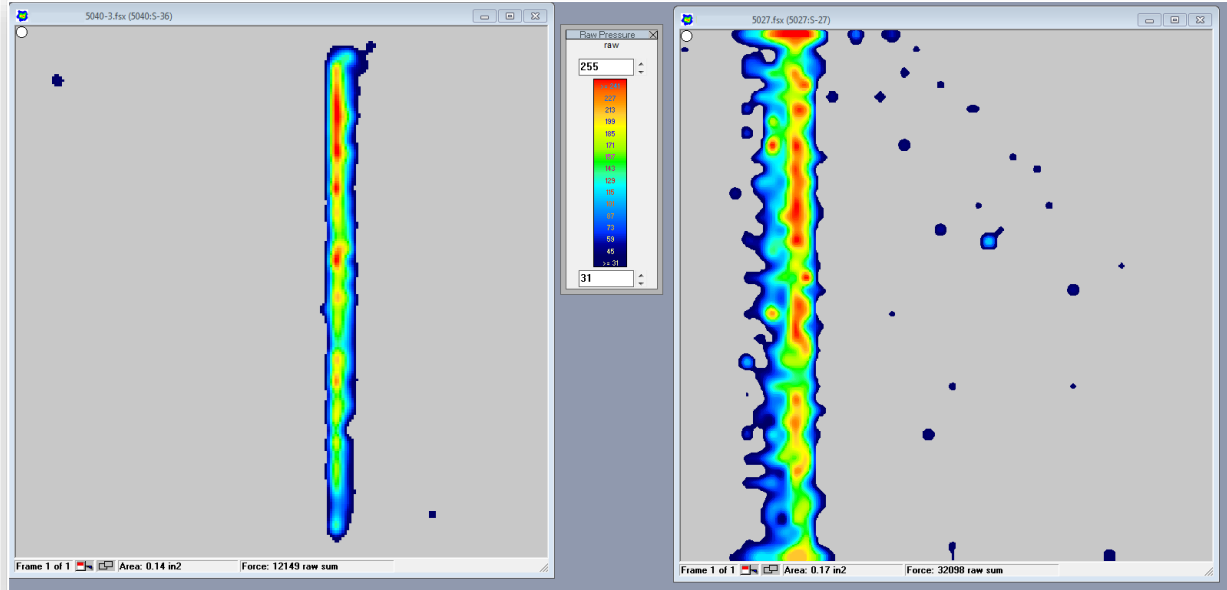


- Misalignment
- Crowns
- Diameter Variations (wear)
- Deflections
- Machine Comparison
- Calibration



MACHINE SETUP / QUALITY CONTROL

NIP/ROLLER APPLICATIONS



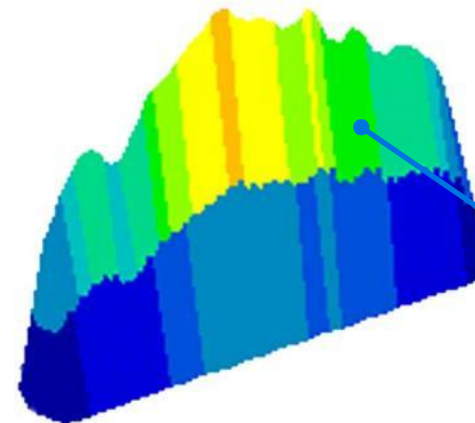
Small Device Printing

SEALING & PACKAGING

SEALING & PACKAGING APPLICATIONS



Sealing jaws

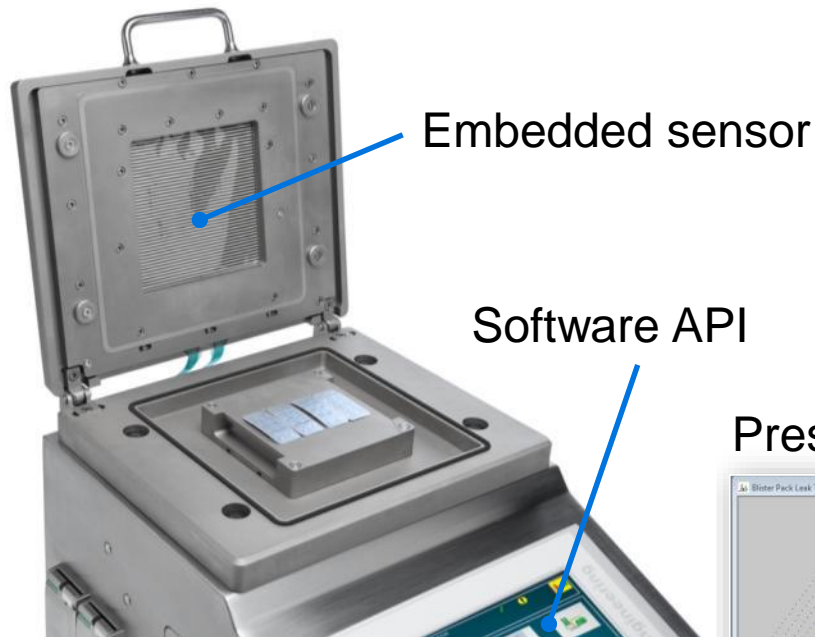


Sealing display

VERIFY MACHINE ALIGNMENT

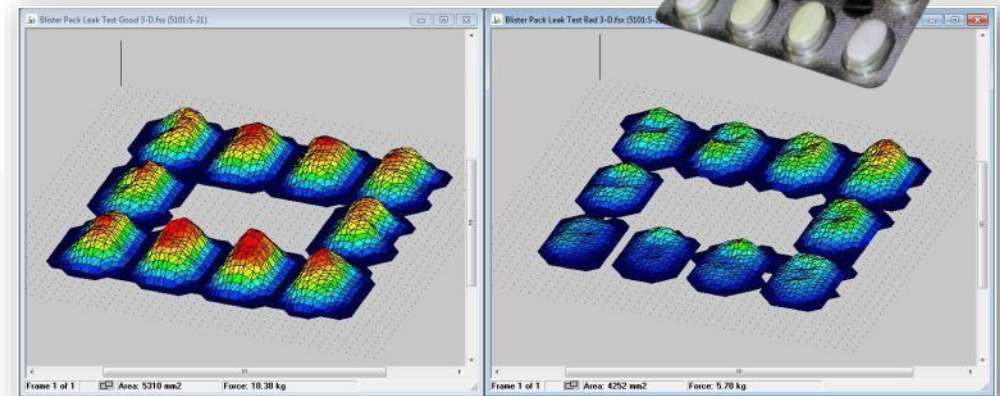
SEALING & PACKAGING APPLICATIONS

OEM MACHINERY WITH SDK



*Pill Blister Leak Testing Machine
(Bonfiglioli Engineering)*

Pressure display comparison



ERGONOMIC

SEATING APPLICATIONS

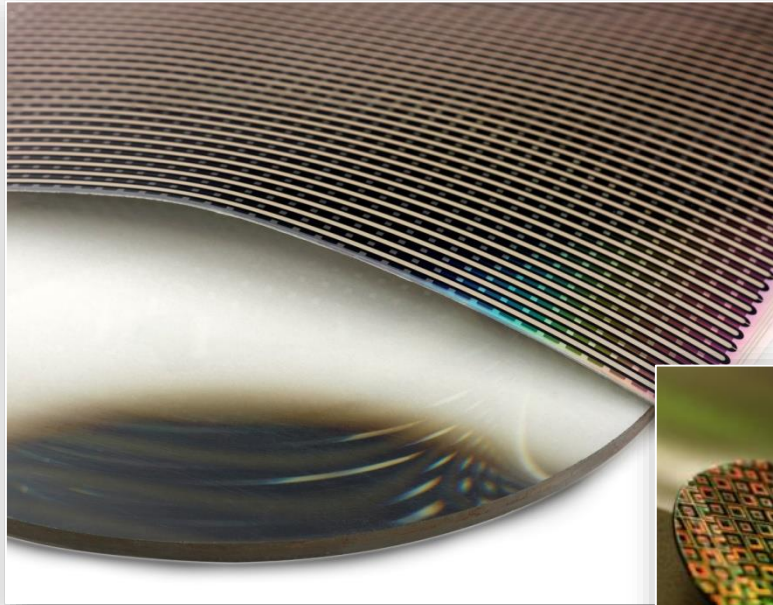


ERGONOMIC/GRIP APPLICATIONS

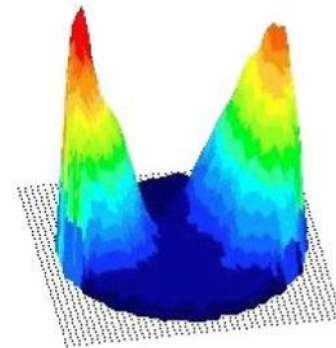
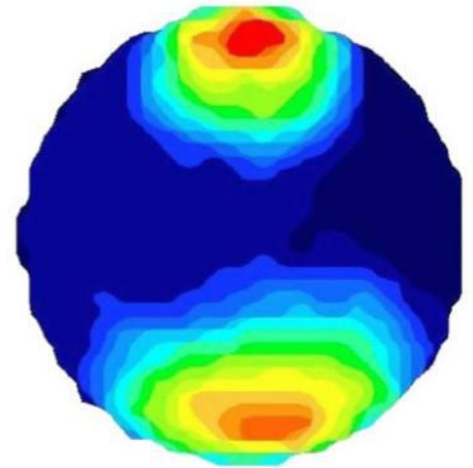
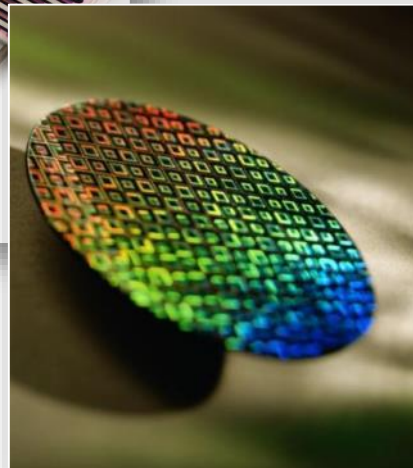


SEMICONDUCTOR

SEMICONDUCTOR APPLICATIONS

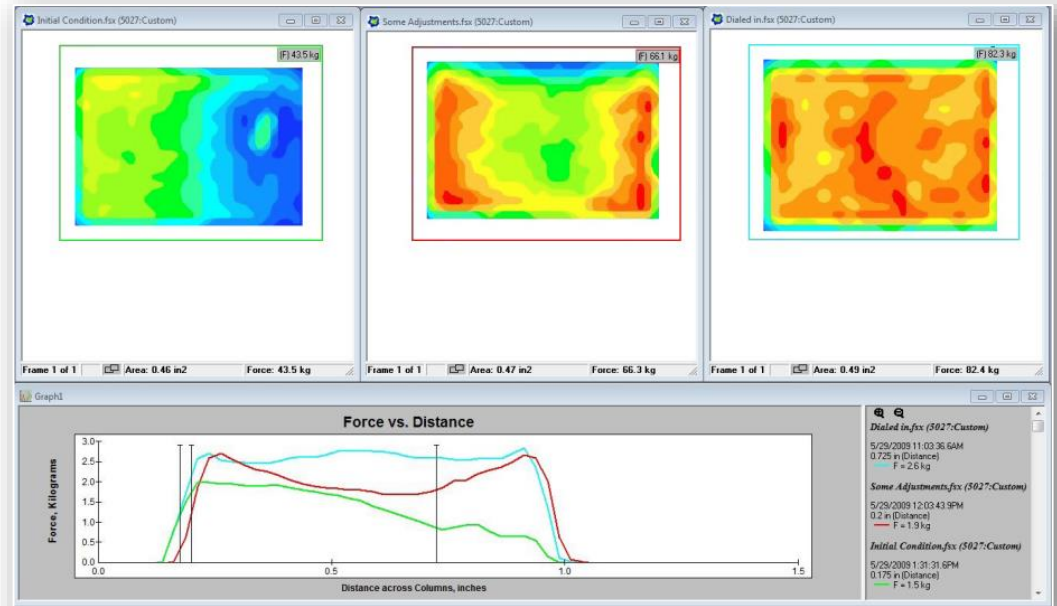
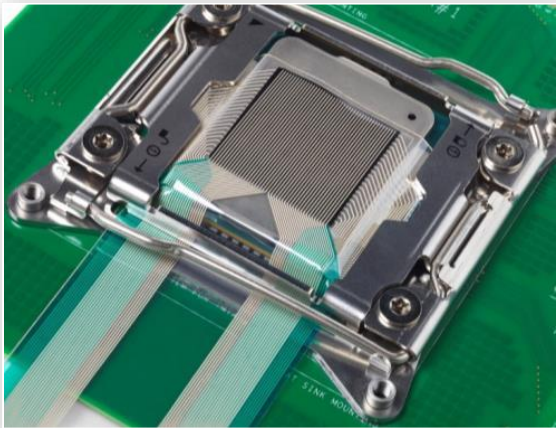


Wafer Polishing



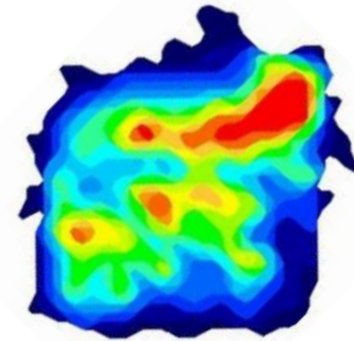
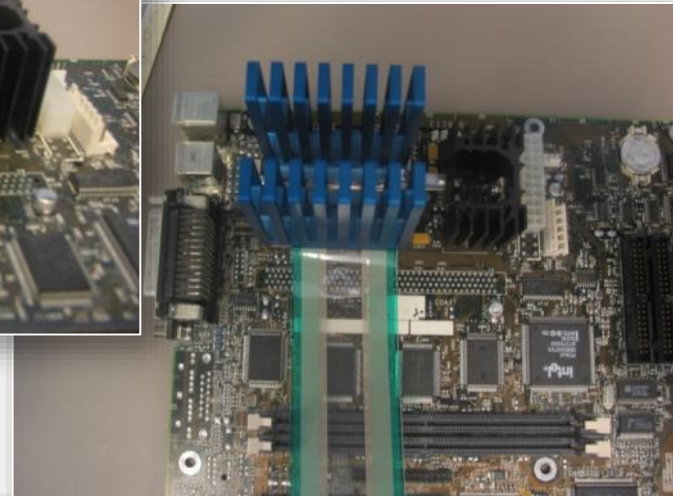
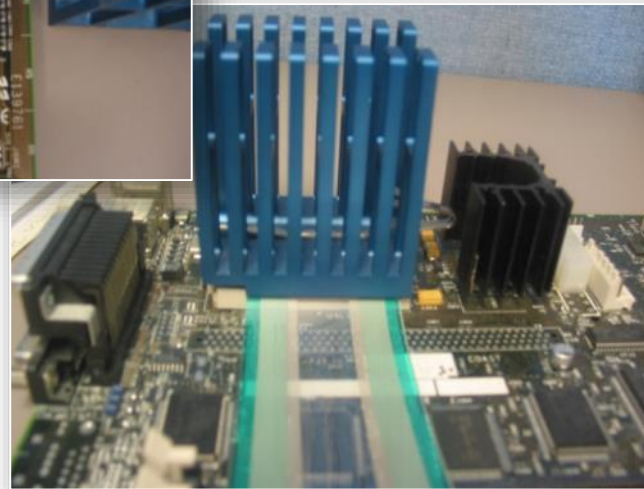
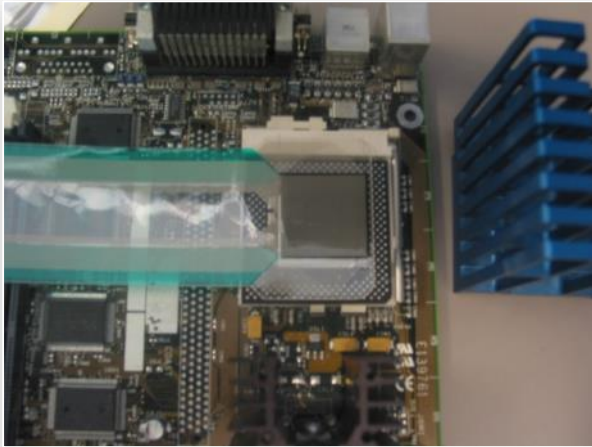
SEMICONDUCTOR APPLICATIONS

Precision Clamping – Heat Sink Mounting



SEMICONDUCTOR APPLICATIONS

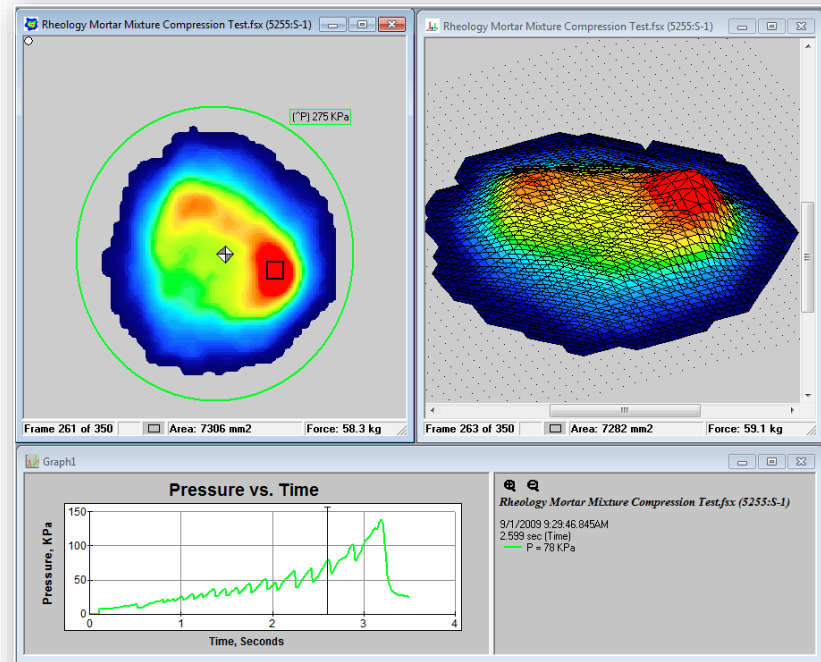
Precision Clamping – Heat Sink Mounting



CIVIL/GEOTECHNICAL

CIVIL/GEOTECHNICAL ENGINEERING APPLICATIONS

Construction Material Testing



Rheology: mortar mixture compression test

CIVIL/GEOTECHNICAL ENGINEERING APPLICATIONS



Flat-jack test

Other tests:

- Seismic activity on building structures
- Landslide impact testing
- Above ground activity on buried structures (ex: pipeline components)
- Flat-jack test – pressure inside a wall



CIVIL/GEOTECHNICAL ENGINEERING APPLICATIONS

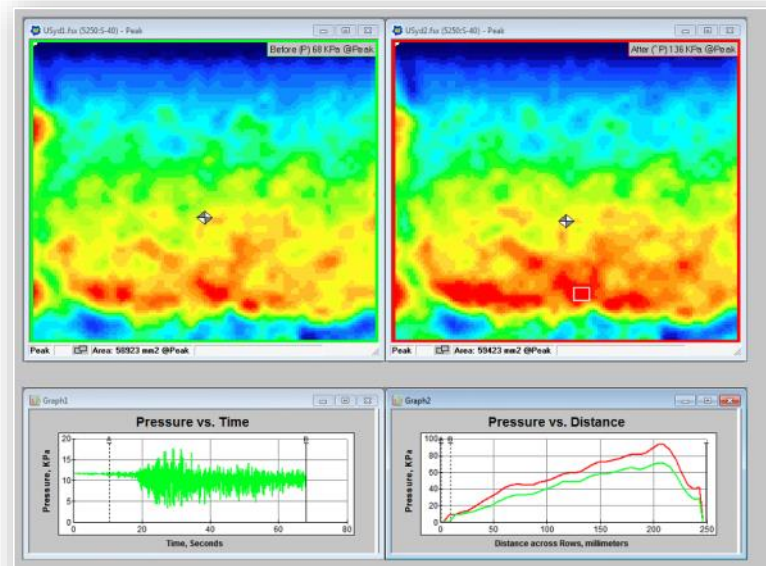
Soil Impact/Compaction Testing

ENVIRONMENTAL INFLUENCE



Sensor buried 100mm below surface

STRUCTURAL INFLUENCE



Sensor buried vertically against tank wall

APPLICATION EXPERIENCE

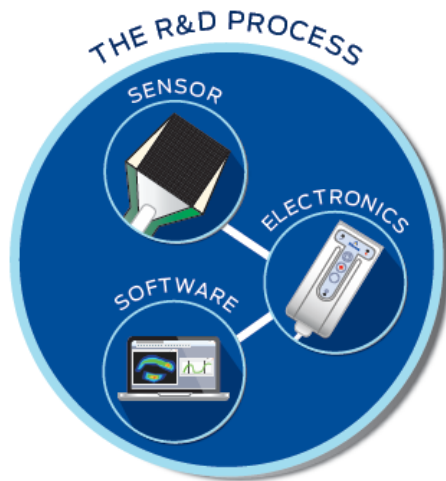
- Experienced sales engineers
- Extensive engineering team
- Passion for sensor technology
- Investment in research



VALIDATING THE TECHNOLOGY: R&D TO FULL INTEGRATION

ROADMAP TO AN INTEGRATED MACHINE DESIGN

PHASE 1



PHASE 2



PHASE 3



Integrating Pressure Mapping Technology can help OEM machine developers **enhance customer loyalty** and be viewed as a **innovation leader in their market.**

IDEAL INDUSTRIES AND APPLICATIONS FOR INTEGRATION

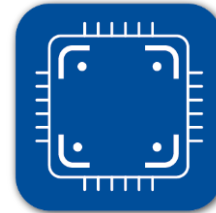
- Noteworthy industries



PRINTING



PACKAGING



**MICROELECTRONIC
COMPONENTS**



**ELECTRONIC
ASSEMBLY**

- Noteworthy applications

- Ultrasonic welding
- Tool & die
- Bar sealing

- Molding
- Thermoforming
- Nip rolls & laminating

EMBEDDED PRESSURE MAPPING CONCEPTS

ULTRASONIC WELDING: CONTACT LENS PACKAGING SOLUTION

- **Problem:** Misaligned seals in contact lens packaging can result in saline solution leaks
- **Solution:** Embedding pressure mapping technology into machine UI ensures proper seal bond run-after-run
 - **Improved yields**
 - **Reduced defects**



Similar applications:

- Single serve packaging
- Toy manufacturing
- Any form, fill, and seal application

SEALING BAR: THE STREAMLINED PACKAGING SOLUTION

- **Problem:** Inconsistent packaging seals on food products can lead to failed inspections and product recalls
- **Solution:** Embedding pressure mapping technology with high-temperature sensors results in a better-controlled sealing process
 - **Better quality & protected product**
 - **Improved consumer trust**

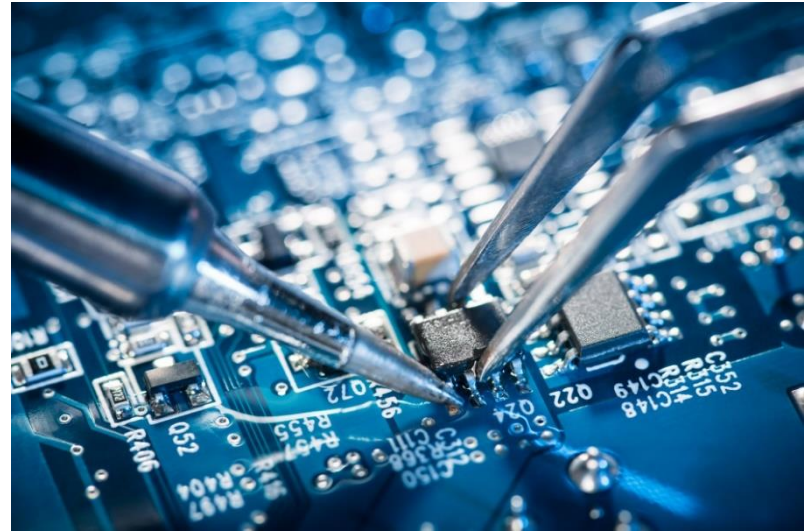


Similar applications:

- Medical supplies
- Cereal bags
- Toothpaste
- Coffee bags

ELECTRONIC ASSEMBLY: THE PICK AND PLACE SOLUTION

- **Problem:** Proper component placement and pressure distribution is crucial in robotic assembly
- **Solution:** Embedding pressure mapping technology verifies robots are interfacing with boards properly and at the correct amount of force
 - Lowered risk of product damage during production
 - Ensured product stability and consistency



Similar applications:

- Robotic chip placement
- Probe card testing
- Heat sinks
- Wafer polishing
- Chemical machine polishing (CMP)

NIP ALIGNMENT: THE ROLL MISALIGNMENT SOLUTION

- **Problem:** Roll misalignment can be an expensive burden on a production run
- **Solution:** Embedding pressure mapping technology can instantly tell the user specifically where rolls should be adjusted to improve throughput
 - **Increased yields and reduced waste**
 - **Reduced downtime for routine setup procedures**



Similar applications:

- Paper printing
- Laminating
- Textiles
- Packaging
- Converting

RESOURCES

EBOOKS & WHITEPAPER

- [Comparison of Interface Pressure Measurement](#)
- [Gaining the Competitive Edge in the Automotive Industry](#)
- [Geotechnical Engineering](#)
- [Ensure & Verify Nip Roll Uniformity](#)
- [Embed Confidence Into Your Machine](#)
- [Pressure Mapping for the Packaging Industry](#)
- [Pressure Mapping as a Research & Development Tool](#)
- [Insight into Semiconductor Quality Manufacturing](#)

VIDEOS

TireScan CrossDrive - Superior Real-Time Tire Tread Analysis
Configurations ranging from passenger vehicle and truck,
to agricultural and aircraft.



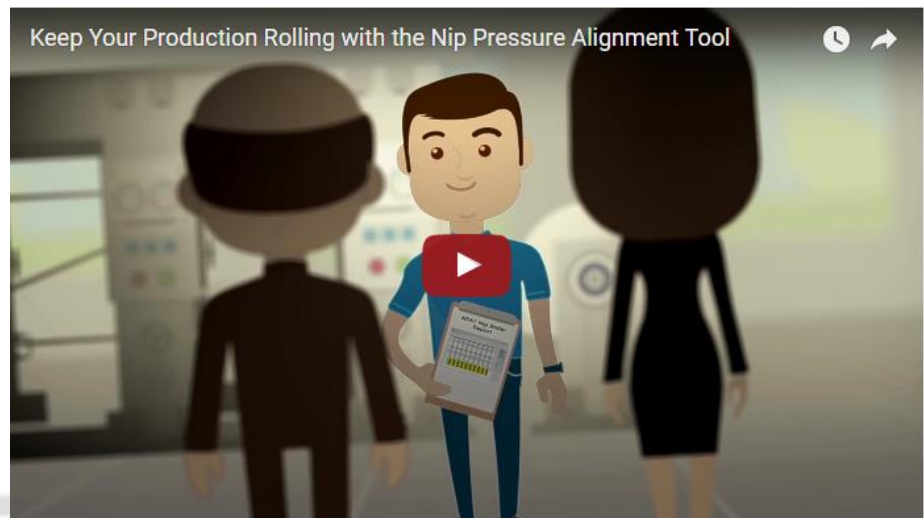
Pressure Mapping in R&D - Evaluating Component Press Fits & Seals
around the cylindrical catalyst during assembly to analyze
local pressures on the contact wall.



Machine Alignment Insights Beyond R&D



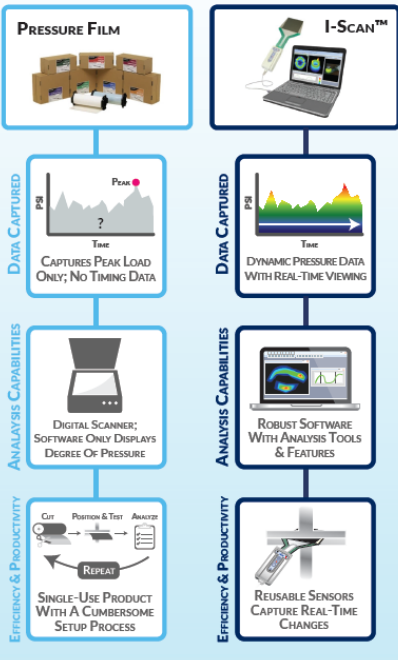
Keep Your Production Rolling with the Nip Pressure Alignment Tool



INFOGRAPHICS

I-SCAN™ OR PRESSURE FILM

How Do They Compare?

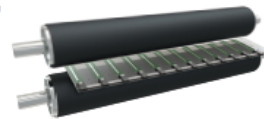


If you're Seeking Dynamic, Real-Time Pressure Data, REQUEST AN I-SCAN DEMO TODAY!

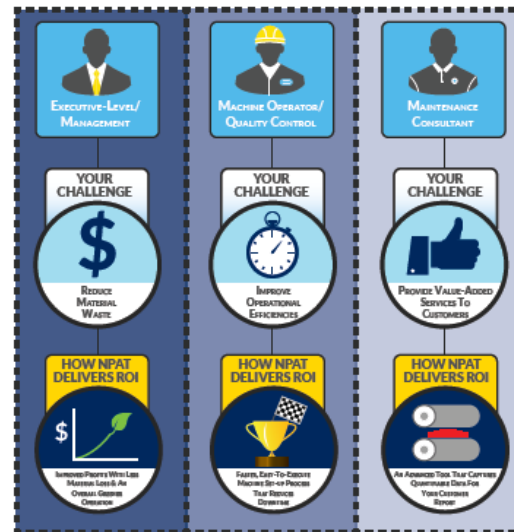
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WHAT'S IN IT FOR YOU?



ROI IS THE NAME OF GAME FOR EVERY CAPITAL INVESTMENT. NO MATTER YOUR ROLE IN THE COMPANY, NPAT IS A VERSATILE MAINTENANCE TOOL USED TO VERIFY NIP UNIFORMITY THAT ALSO DELIVERS ROI IN VERSATILE WAYS.

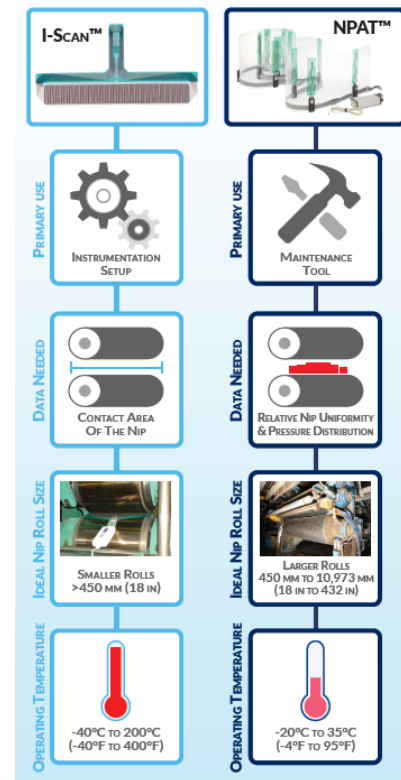


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WHICH SYSTEM IS RIGHT FOR YOU?



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Dave Otto
Former Senior Research Engineer
Dupont

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