

## GOM

# Precise Industrial 3D Metrology

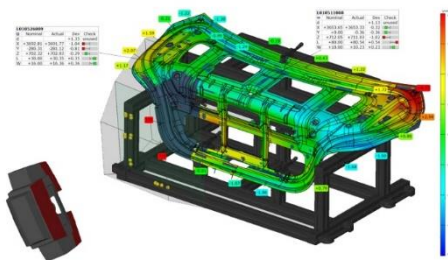
Savarino Luca



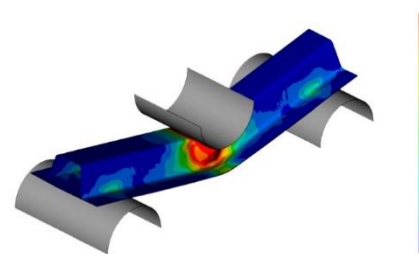
Global industrial partner with over 20 years experience in the development and production of optical 3D metrology solutions

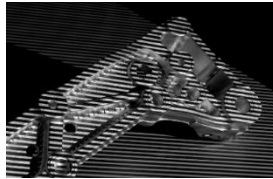
Hardware and Software

3D coordinate measurement



Material and component testing

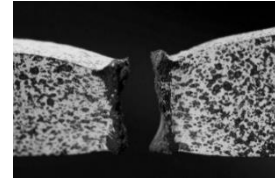




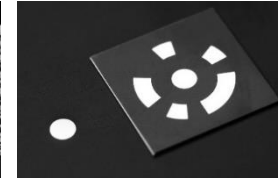
Projected pattern



Regular pattern



Stochastic pattern



Point markers

- Digital image processing
- 3D coordinate measurement techniques
- Quality control
- Material parameters
- Automation

Customer focus development of precise industrial 3D metrology

Establishing new approaches with GOM technologies in existing processes

Deploy and support these processes worldwide



#### GOM

- Founded in 1990
- Private, owner managed company
- Development, production and administration in Braunschweig, Germany

#### GOM Network

- GOM Group with 8 companies and branches
- Continuous growth to over 600 employees within GOM Group
- 36 sales and support partners with over 55 offices worldwide
- 1000 employees in worldwide network

Optical metrology has become a standard in the development and production of industrial products

GOM measurement systems are used worldwide in industry, research institutions and universities



Automotive industry



Aerospace industry



Consumer goods industry



Research and universities

**Automotive**

Audi, Avtovaz, Bentley, BMW, Chrysler, Daihatsu Motor, Daimler, Fiat, Ford, GM, Honda, Hyundai, Isuzu, Jaguar, Kia, Land Rover, McLaren, Modenas, NAZA, Nissan, Opel, Porsche, PSA, Renault, Seat, Skoda, Subaru, Suzuki, Tata Motors, Toyota, VW, Volvo, Temsa, ...

**Automotive Suppliers**

Automotive Lighting, Batz, Bertrandt, Bosch, Bombardier, Bridgestone, Carcoustics, DAAZ, Dräxlmaier, Faurecia, Georg Fischer, Gienanth, Goodyear, Hella, Johnson Controls, Kautex Textron, Michelin, Nothelfer, Pininfarina, Siemens, Thule, ThyssenKrupp, ZF Sachs, ...

**Aerospace**

Airbus, Air Force Research Labs, Aselsan, Boeing, Cessna, Chrom Alloy, DLR, DNV, EADS, Eurocopter, FAA, FOI, Goodrich, Gorbynov Aviation, Hansen Transmissions, Hydro, IMPO, JAXA, Lockheed Martin, NASA, NLR, Northrop Grumman, ONERA, Vulcan Air, VZLÚ, ...

Over 8000 system installations worldwide

**Turbines**

ABB Turbo systems, Alstom, Aviadvigatel, BTL, Chromalloy, Elbar Sulzer, E.ON, Gorbynov Aviation, Honeywell, Howmet, IMA Dresden, MTU, Pratt & Whitney, Rolls Royce, Salut, Saturn, Siemens PG, Snecma, Solar Turbines, Triumph, Turbine Services, ...

**Consumer Goods**

Adidas, Asics, ASUS, Blaupunkt, Bosch, Braun, Ching Luh Shoes, Ecco, FisherPrice, Foxconn, Fuji, Gillette, Greenpoint, Hilti, Lego, LG Electronic, Mattel, Microsoft, Motorola, Nautor, Nike, Nokia, Philips, Reebok, Samsung, SANYO, Siemens, Sony, Stihl, Villeroy+Boch, Walt Disney, ...

**Material Supplier**

ACTech, Alfa Laval, Alcan (Aluisse), Arcelor, , BASF, Bayer, Corning, DuPont, EXXON, Hydro (VAW), Pierburg Kolbenschmidt, Salzgitter, Shell, Tata Steel, Thyssen Krupp, Thyssen Nirosta, Tokai Rubber Industries, Voest Alpine Stahl, ...

GOM solutions simplify complex measurement tasks in product development and production

- Improving product quality and production throughput
- Shortening of development processes
- Improving quality assurance throughout the entire product life cycle

Cost reduction

Improvement of competitiveness



GOM measuring systems are based on digital image processing





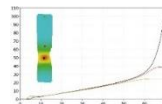
ATOS  
Full-field  
3D Scanning



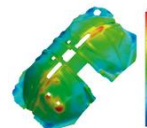
TRITOP  
Mobile  
Optical CMM



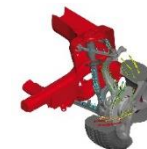
ARAMIS  
Optical  
3D Deformation Analysis



ARGUS  
Optical  
Forming Analysis



PONTOS Live  
3D Motion Analysis &  
Component Positioning



GOM Inspect



GOM Inspect Professional

**Non-contact,  
full-field 3D metrology**

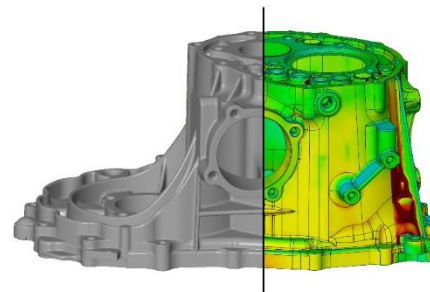
Complete component geometry

Precise 3D coordinates

Deviation to CAD

Shape and dimension analysis

Reporting



**Applications**

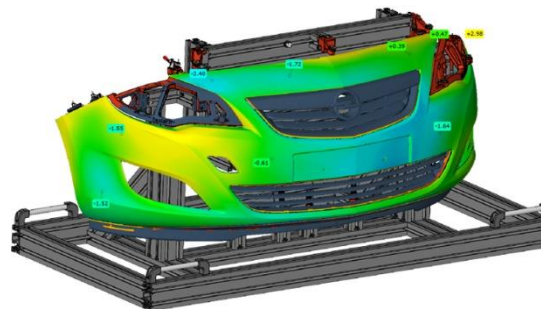
Quality control

Reverse Engineering

Rapid prototyping

Manufacturing

Virtual assembly



## Automated full-field 3D metrology

Standardized robotic measurement cell

Fully automated 3D digitizing and inspection

For different component sizes and applications



**3D coordinates for large objects, deformation analysis and ATOS**

Precise 3D coordinates of surface points, sections, primitives, ...

CAD comparison

GD&T

3D displacement and deformation

Bending, torsion, deflection



### Applications

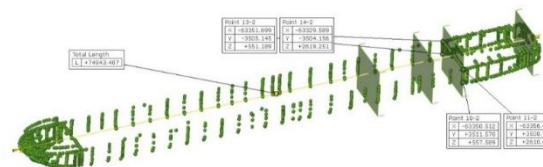
Quality assurance of large objects

Monitoring of fixtures, gauges, machines

Deformation analysis and testing applications in automotive and aerospace areas

Climate and environmental chambers

Determination of ATOS reference points



**Full-field and point-based material and component testing**

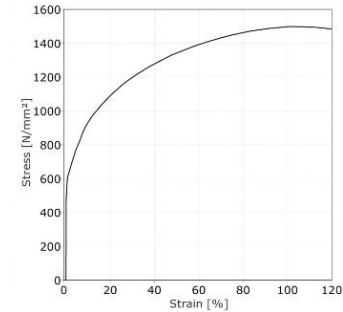
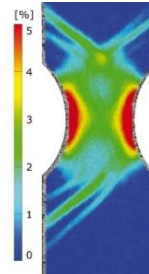
3D surface coordinates

3D displacement, velocity and acceleration

Surface strains

Strain rates

Buckling



**Applications**

Determination of material properties (FLC)

Dynamic behavior of components

Component analysis

Structural testing and vibrations

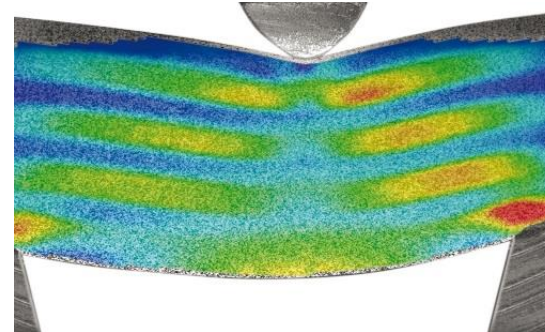
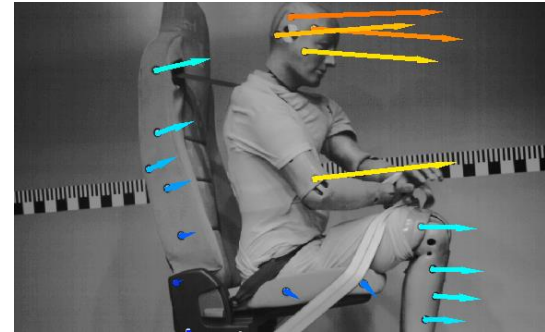
Verification of FE simulations

Real-time control of testing machines

Crash and impact tests

Durability and fatigue studies

NDT (Non Destructive Testing)





**Forming analysis for sheet metal**

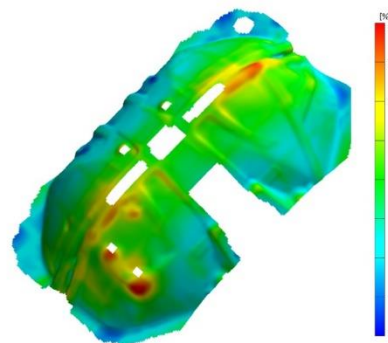
Full-field measurement

3D coordinates of component surface

Form change (major and minor strain)

Thickness reduction

Forming Limit Diagram



## Applications

Detection of critical deformation areas

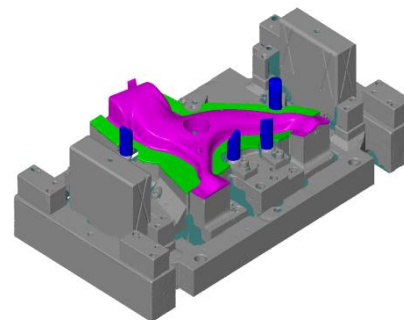
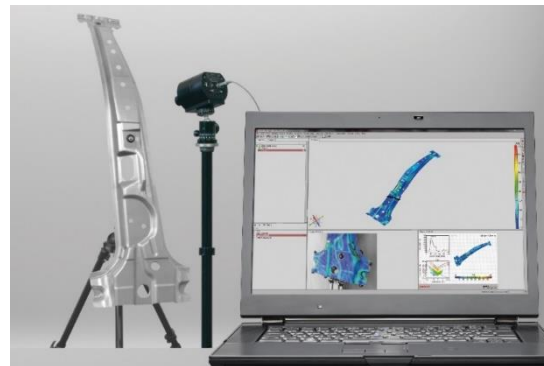
Solving complex forming problems

Optimization of forming processes

Verification of tools and tool changes

Optimization of numerical simulations

Adaptation of tool parameters



**Online measurement, positioning and motion analysis of 3D coordinates**

Point-based 3D metrology

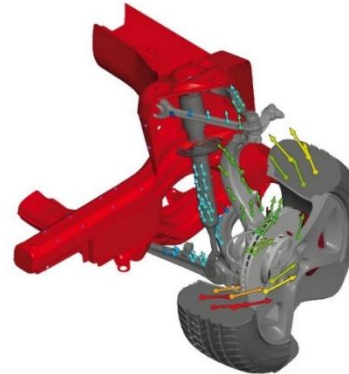
Live 3D coordinates and displacements

Deformation, velocity and acceleration

Deviation to CAD

Recording of analog signals

Digital data communication with external data loggers from test stands



## Applications

- Dynamic component behavior
- Performance, durability and reliability tests
- Stiffness tests from structures and components
- Frequency analysis
- Vibration and noise analysis
- Structural vibrations
- Non Destructive Testing
- Positioning of components



### 3D Inspection

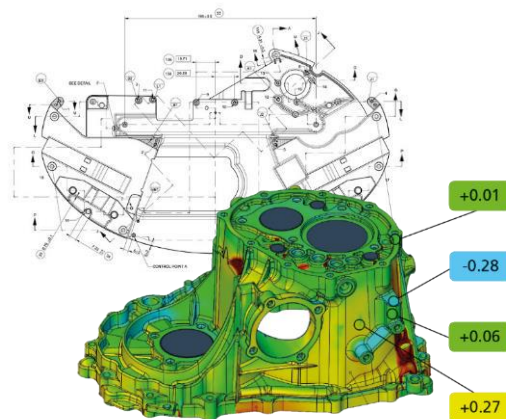
CAD and measurement plan import

Alignments and element construction

CAD Comparison

GD&T, trend, SPC, motion and deformation analysis, curve, airfoil and point-based inspection, ...

Reporting



GOM Inspect



GOM Inspect Professional

### Mesh Processing

Import of point clouds

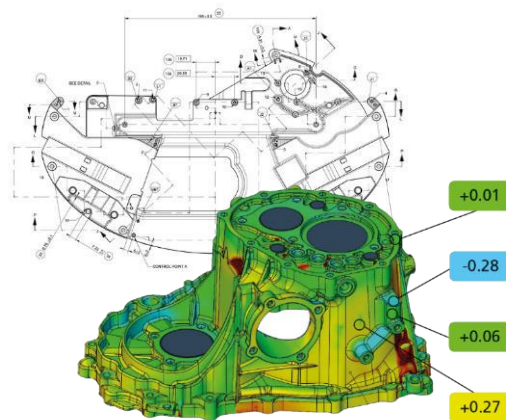
Polygonization of point clouds

Thinning, hole-filling or smoothing meshes, ...

### Viewer

For ATOS Professional, TRITOP Professional, GOM Inspect Professional

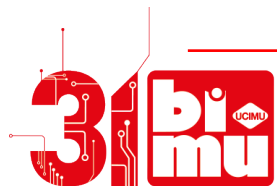
3D viewing & presentation



GOM Inspect



GOM Inspect Professional



**fieramilano**

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**Thank you for your attention**

