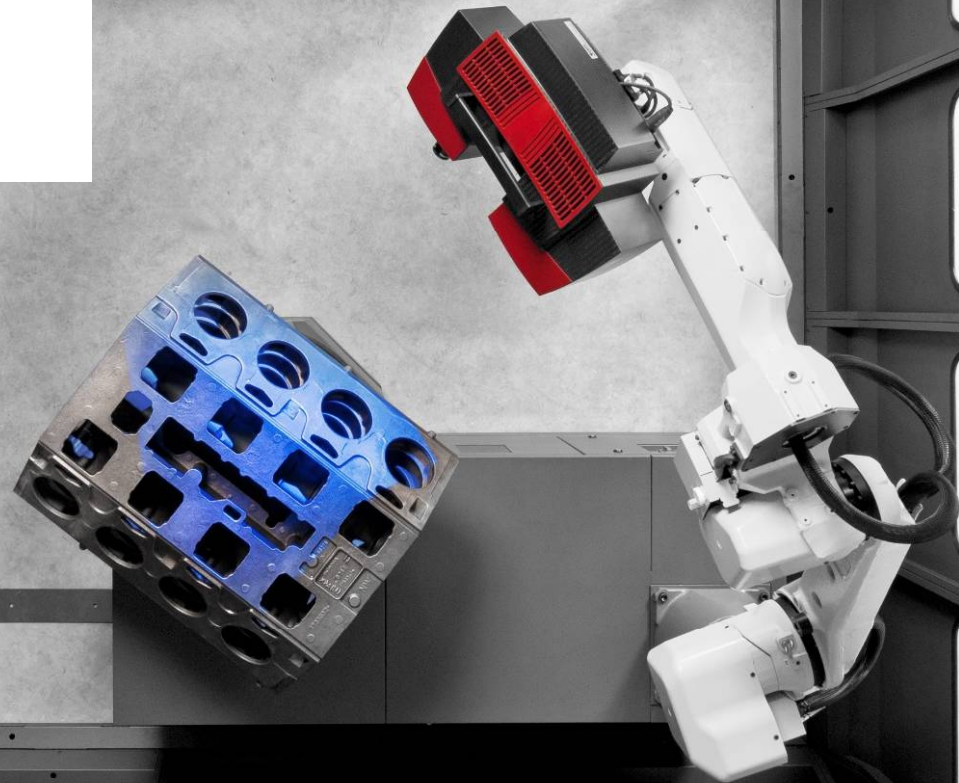


LS-DYNA Conference 2015

GOM Precise Industrial 3D Metrology

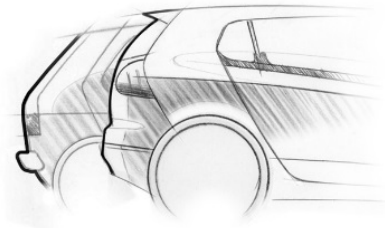
gom



Changing products



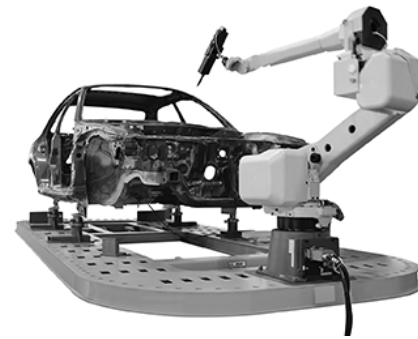
Changing requirements for metrology



Changing products



Changing product development cycles



Changing production technologies



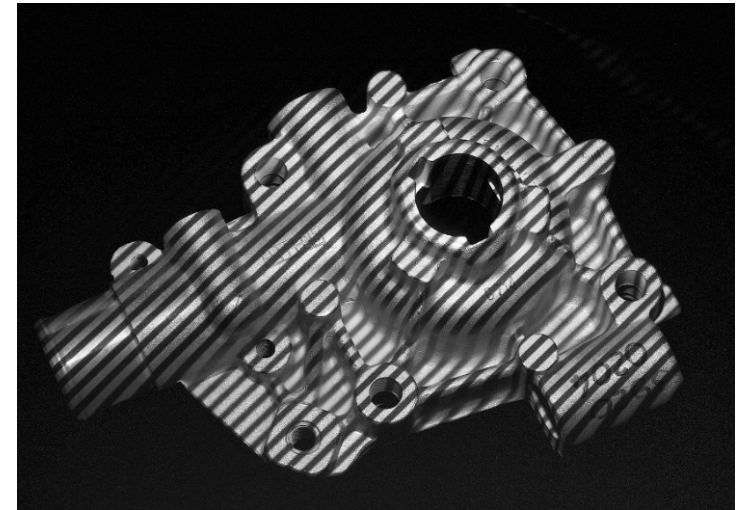
Changing quality demands

GOM – Precise Industrial 3D Metrology



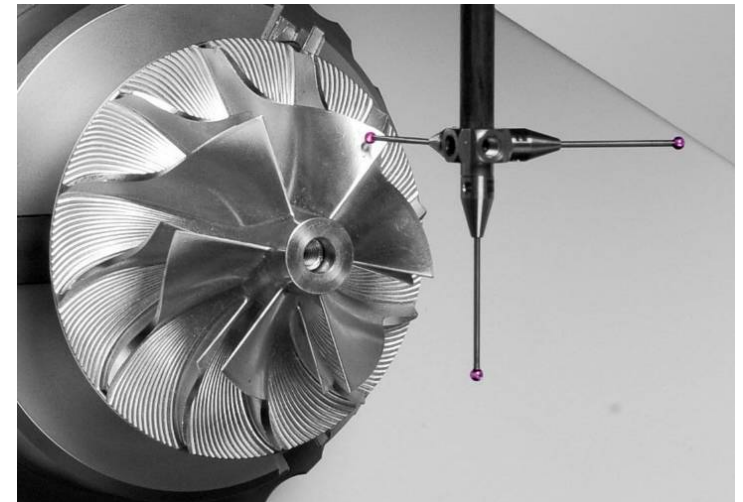
Optical metrology from GOM provides:

- Fast measurement and results
- Clear visualization of measurement reports
- Flexibility for task, location and parts
- Mobile measurement solutions
- Process safety



GOM measuring systems are complementary or used as an alternative to:

- 3D coordinate measuring machines
- Gauges
- Accelerometers and displacement sensors
- Strain gauges



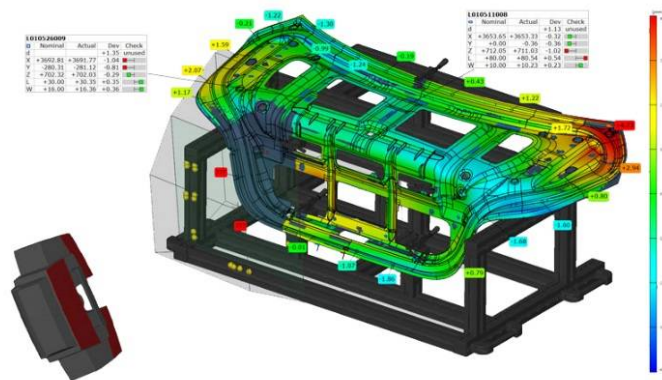
GOM is a technology company



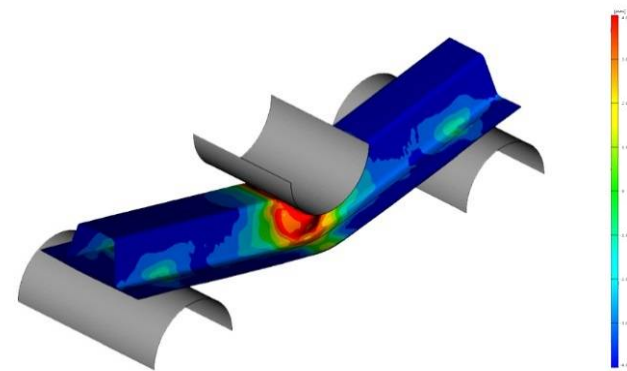
Global industrial partner with over 20 years experience in the development and production of optical 3D metrology solutions

Hardware and Software

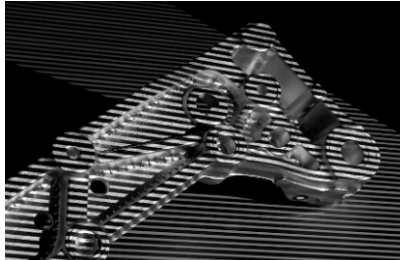
3D coordinate measurement



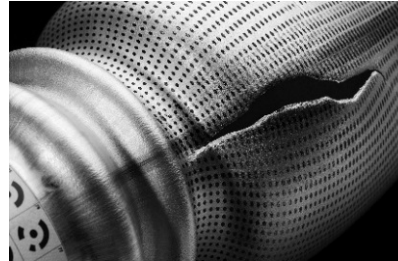
Material and component testing



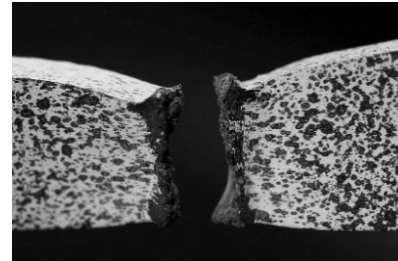
GOM – Our know-how



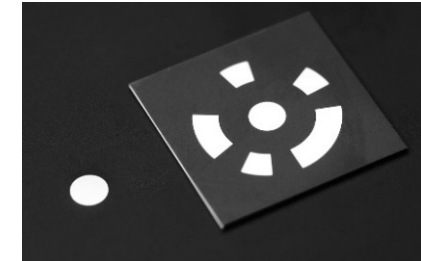
Projected pattern



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



GOM headquarters in Braunschweig



Founded in 1990

Private, owner managed company

Development, production and
administration in Braunschweig,
Germany

GOM – The Owners



Dr. Konstantin Galanulis
Founder of GOM

Sales
Finance
Human Resources



Dr. Detlef Winter
Founder of GOM

Hardware Development
Automation
Production



Dirk Bergmann
Owner of GOM

Software Development
Support
Product Management

GOM Network



GOM Group with 9 companies and branches

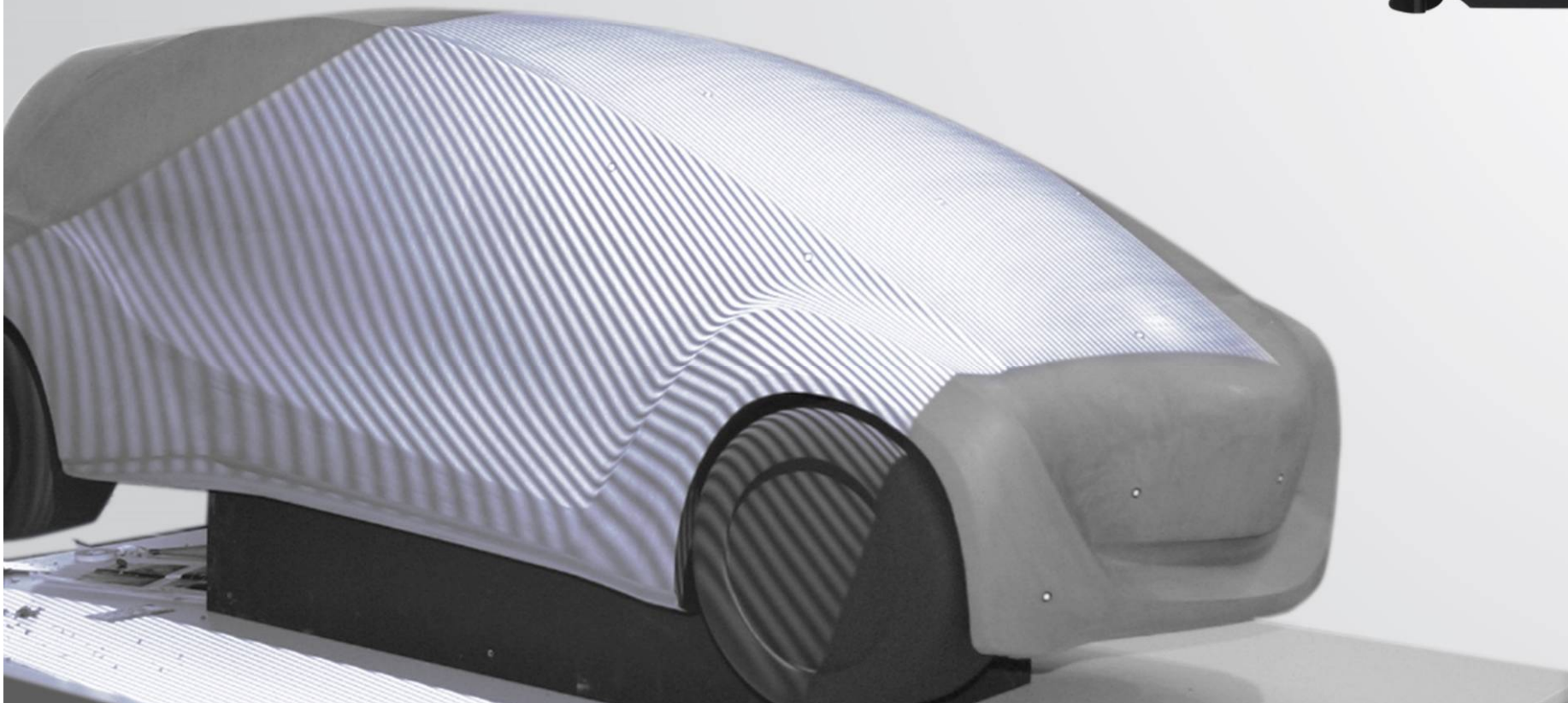
Continuous growth to over 350 employees within GOM Group

36 sales and support partners with over 55 offices worldwide

700 employees in worldwide network

Measuring Systems

GOM measuring systems are based on digital image processing



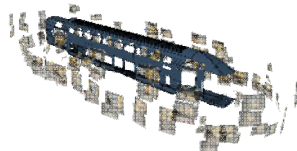
Metrology Systems



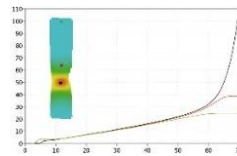
ATOS
Full-field
3D Scanning



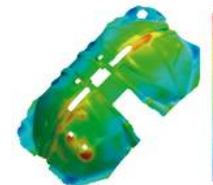
TRITOP
Mobile
Optical CMM



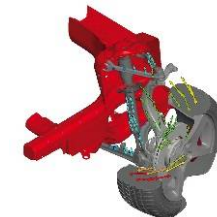
ARAMIS
Optical
3D Deformation Analysis



ARGUS
Optical
Forming Analysis



PONTOS Live
3D Motion Analysis &
Component Positioning



GOM Inspect



GOM Inspect
Professional

ATOS

Full-field 3D Scanning



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

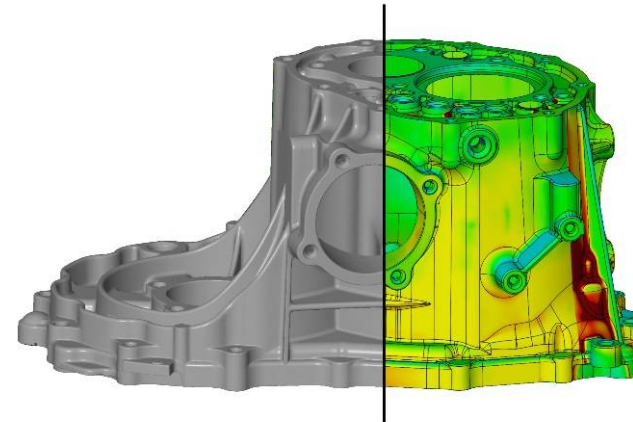
Complete component geometry

Precise 3D coordinates

Deviation to CAD

Shape and dimension analysis

Reporting



ATOS

Full-field 3D Scanning



Applications

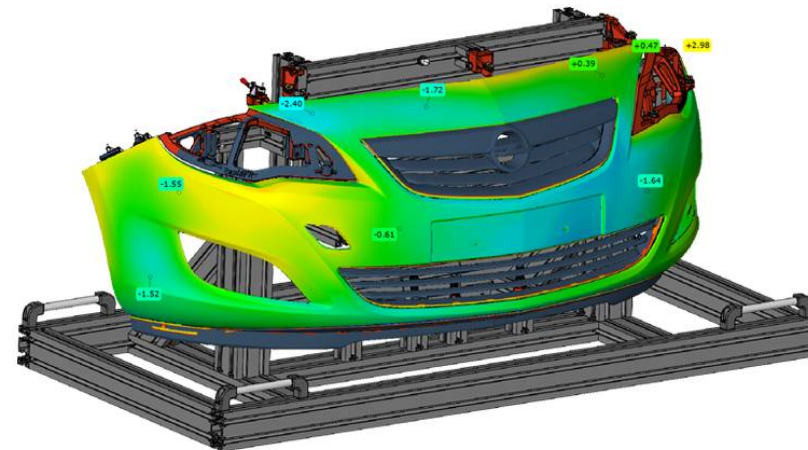
Quality control

Reverse Engineering

Rapid prototyping

Manufacturing

Virtual assembly



ATOS ScanBox Optical 3D measuring machine

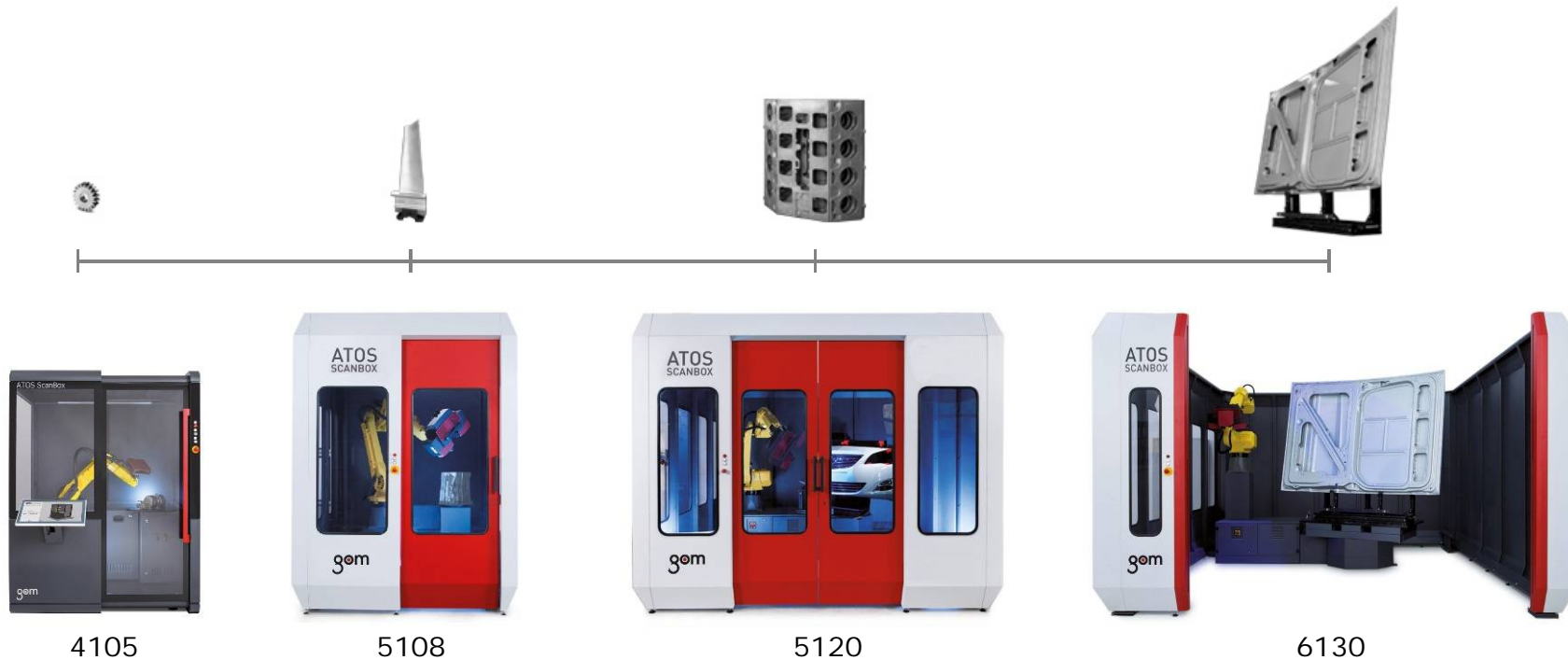


Automated full-field 3D metrology

Standardized robotic measurement cell

Fully automated 3D digitizing and inspection

For different component sizes and applications



TRITOP

Mobile Optical CMM



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

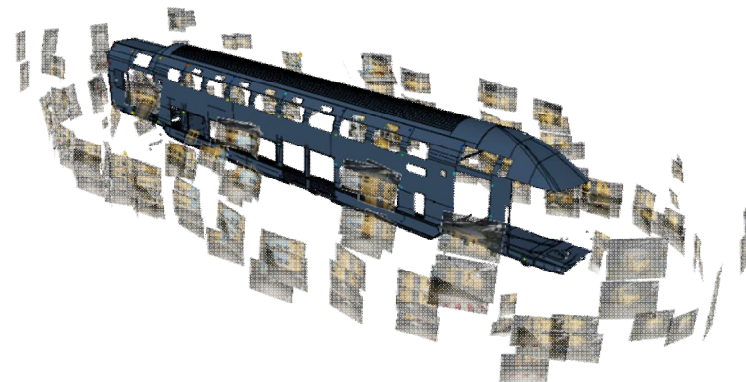
Precise 3D coordinates of surface points,
sections, primitives, ...

CAD comparison

GD&T

3D displacement and deformation

Bending, torsion, deflection



TRITOP

Mobile Optical KMG



Applications

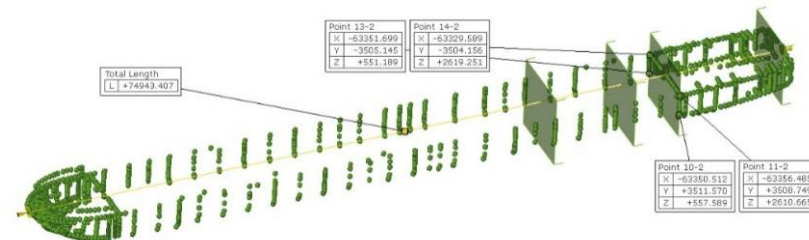
Quality assurance of large objects

Monitoring of fixtures, gauges, machines

Deformation analysis and testing applications in automotive and aerospace areas

Climate and environmental chambers

Determination of ATOS reference points



ARAMIS

Optical 3D Deformation Analysis



Full-field and point-based material and component testing

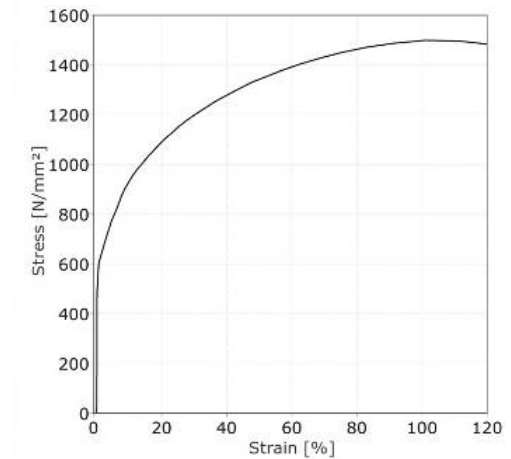
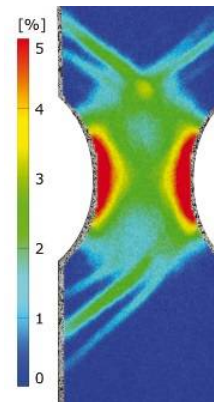
3D surface coordinates

3D displacement, velocity and acceleration

Surface strains

Strain rates

Buckling



ARAMIS

Optical 3D Deformation Analysis



Applications

Determination of material properties (FLC)

Dynamic behavior of components

Component analysis

Structural testing and vibrations

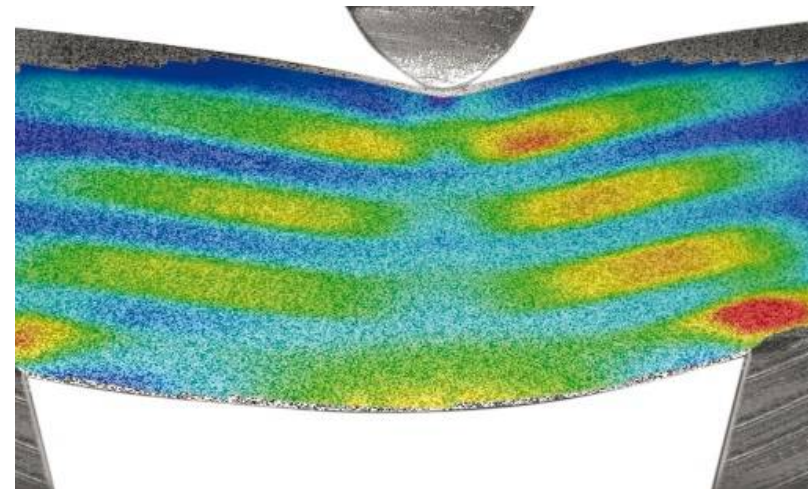
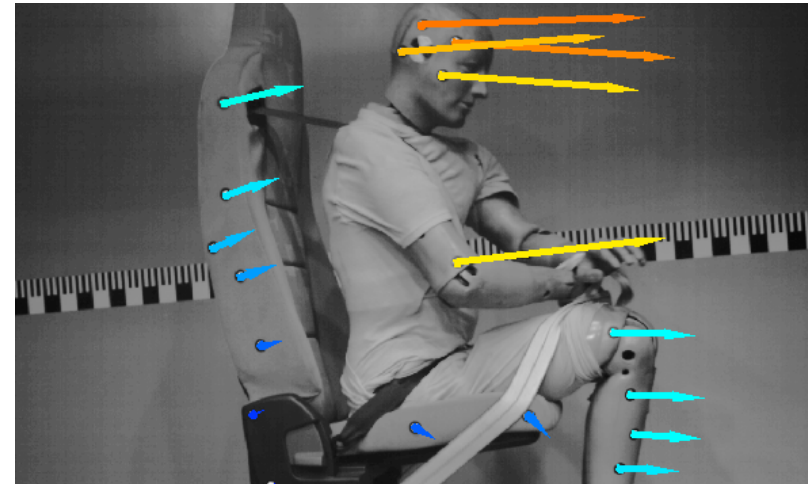
Verification of FE simulations

Real-time control of testing machines

Crash and impact tests

Durability and fatigue studies

NDT (Non Destructive Testing)



ARGUS

Optical Forming Analysis



Forming analysis for sheet metal

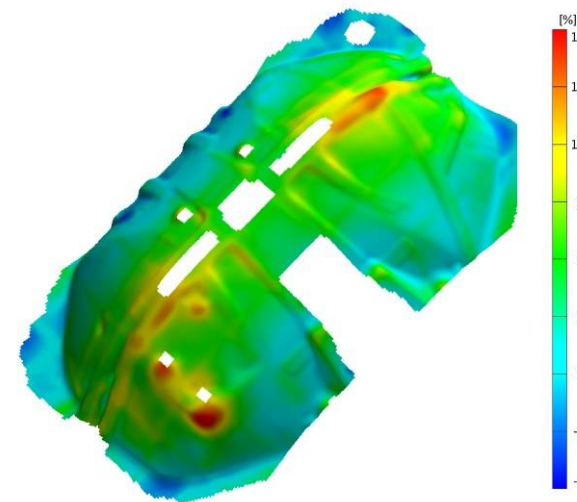
Full-field measurement

3D coordinates of component surface

Form change (major and minor strain)

Thickness reduction

Forming Limit Diagram



ARGUS

Optical Forming Analysis



Applications

Detection of critical deformation areas

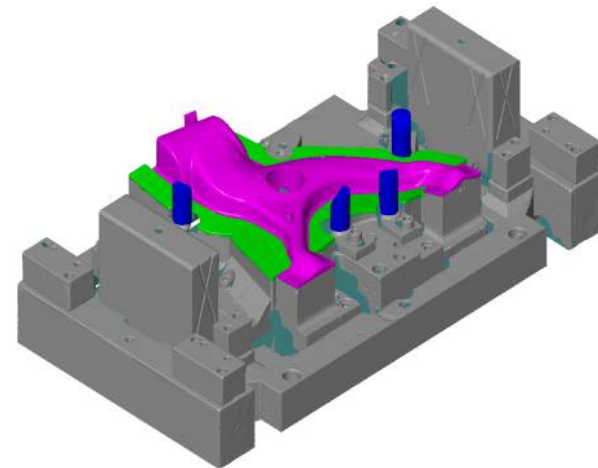
Solving complex forming problems

Optimization of forming processes

Verification of tools and tool changes

Optimization of numerical simulations

Adaptation of tool parameters



PONTOS Live

3D Motion Analysis & Component Positioning



Online measurement, positioning and motion analysis of 3D coordinates

Point-based 3D metrology

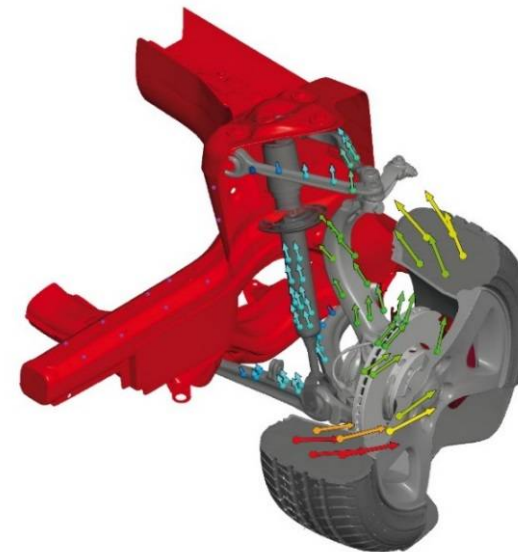
Live 3D coordinates and displacements

Deformation, velocity and acceleration

Deviation to CAD

Recording of analog signals

Digital data communication with external data loggers from test stands



PONTOS Live

3D Motion Analysis & Component Positioning



Applications

Dynamic component behavior

Performance, durability and reliability tests

Stiffness tests from structures and components

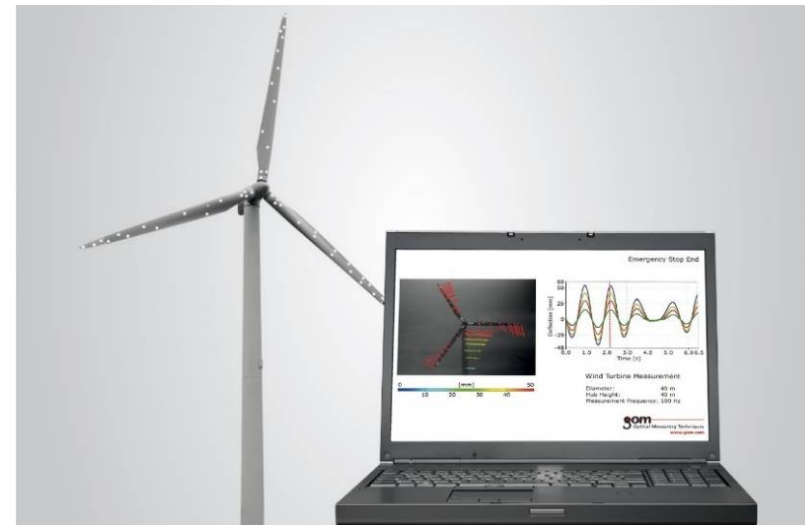
Frequency analysis

Vibration and noise analysis

Structural vibrations

Non Destructive Testing

Positioning of components



GOM Inspect Evaluation Software for 3D Point Clouds



3D Inspection

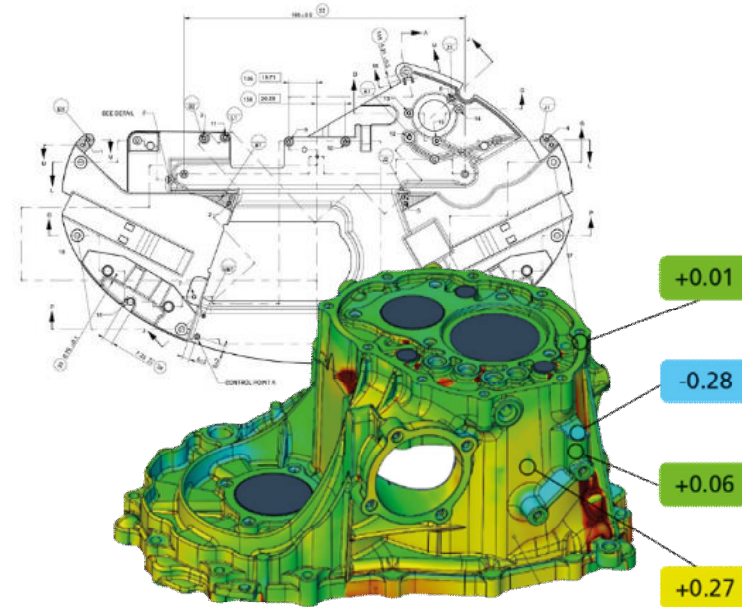
CAD and measurement plan import

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

GOM Inspect Evaluation Software for 3D Point Clouds



Mesh Processing

Import of point clouds

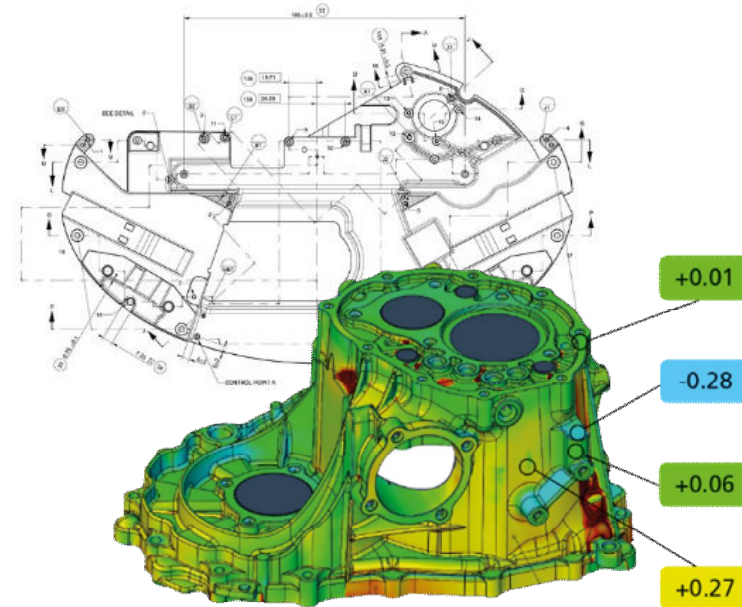
Polygonization of point clouds

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

Viewer

For ATOS Professional, TRITOP Professional,
GOM Inspect Professional

3D viewing & presentation



GOM Inspect



GOM Inspect
Professional

Industry-specific
solutions from a single
source



Set standards



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

GOM – Customers (Extract)



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, ...

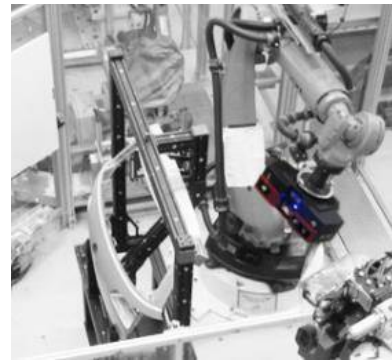
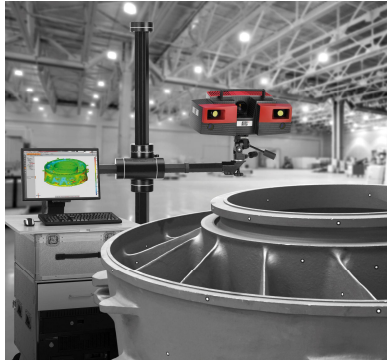
Consumer Goods

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

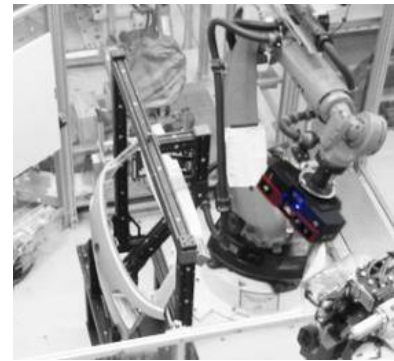
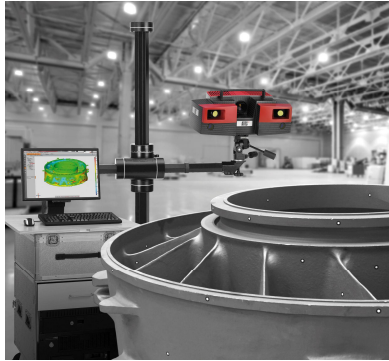
GOM – What we stand for



Certified Precision

- GOM systems are certified according to proprietary and public standards (VDI)
- GOM software is certified to NIST and PTB
- GOM metrology solutions automatically monitor their system accuracy

GOM – What we stand for

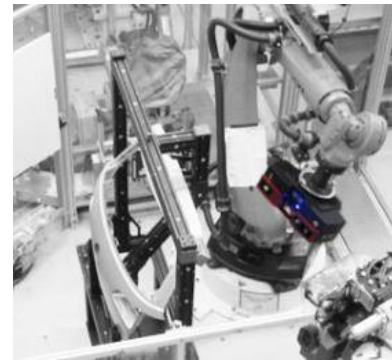
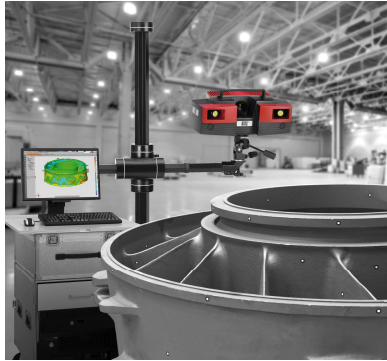


Certified Precision

Application knowledge and industry know-how

- Support from experienced engineers with understanding of industrial processes
- Systems as well as process- and metrology expertise for solving specific tasks
- Knowledge transfer through training, application workshops and conferences

GOM – What we stand for



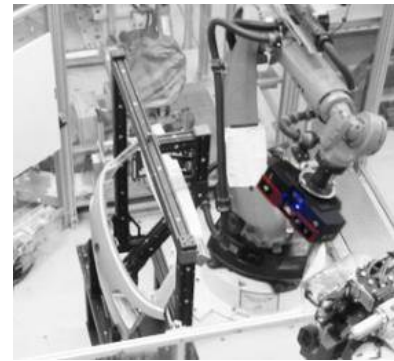
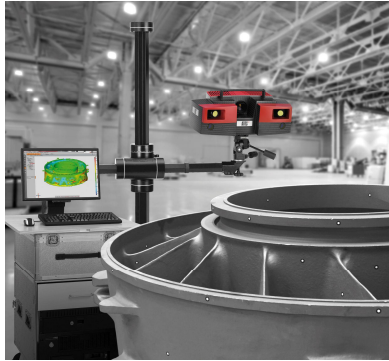
Certified Precision

Application knowledge and industry know-how

Proven high-end technology

- GOM measuring systems are developed for industrial use
- GOM's solutions are in continuous operation (24/7) in production environments
- Over 8000 systems worldwide monitor the product quality of our customers

GOM – What we stand for



Certified Precision

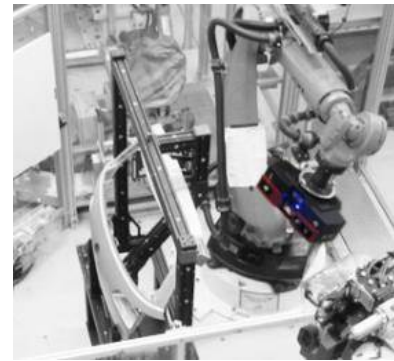
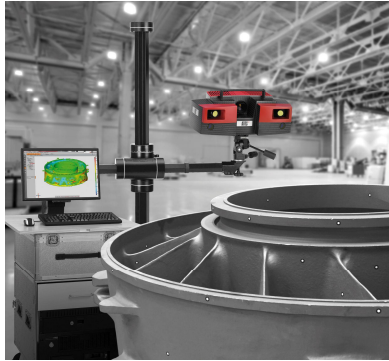
Application knowledge and industry know-how

Proven high-end technology

Sustainability

- Continuous improvement of hardware and software with a long spare part availability
- Concentration on industrial 3D metrology with a high investment in new developments

GOM – What we stand for



Certified Precision

Application knowledge and industry know-how

Proven high-end technology

Sustainability

Partnership and Customer Care

- Partnership throughout the entire life cycle of measurement solutions
- GOM network enables the global deployment of optical metrology

GOM solutions



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 – Precise Industrial 3D Metrology

Thank you for your attention.

info@gom.com
www.gom.com