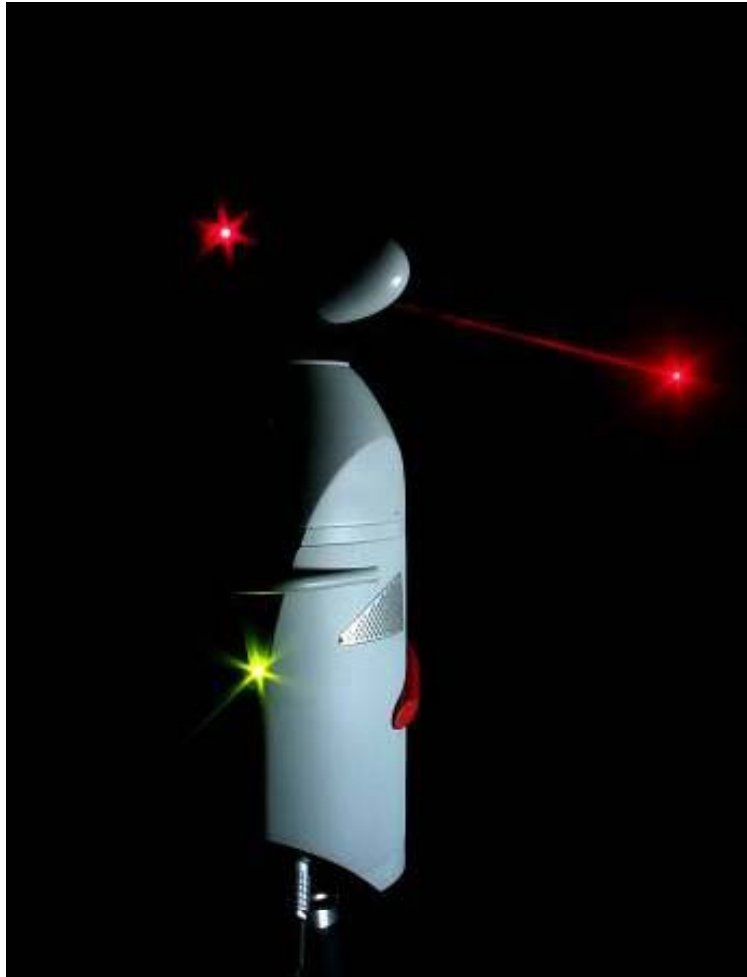


# METROLOGY

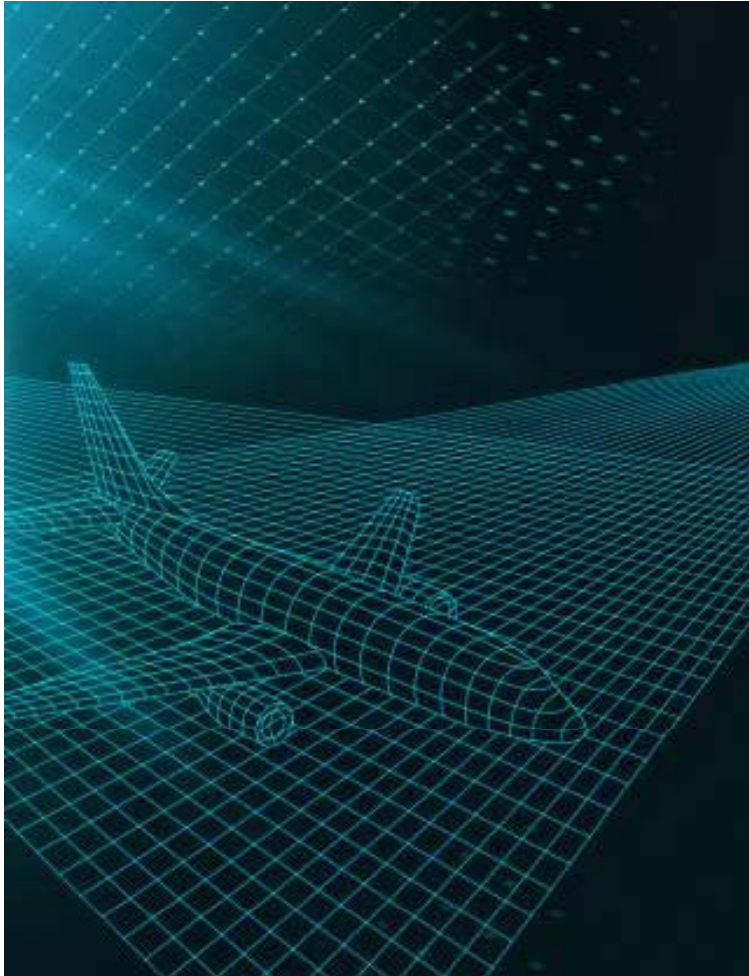
WHEN YOU NEED TO BE SURE





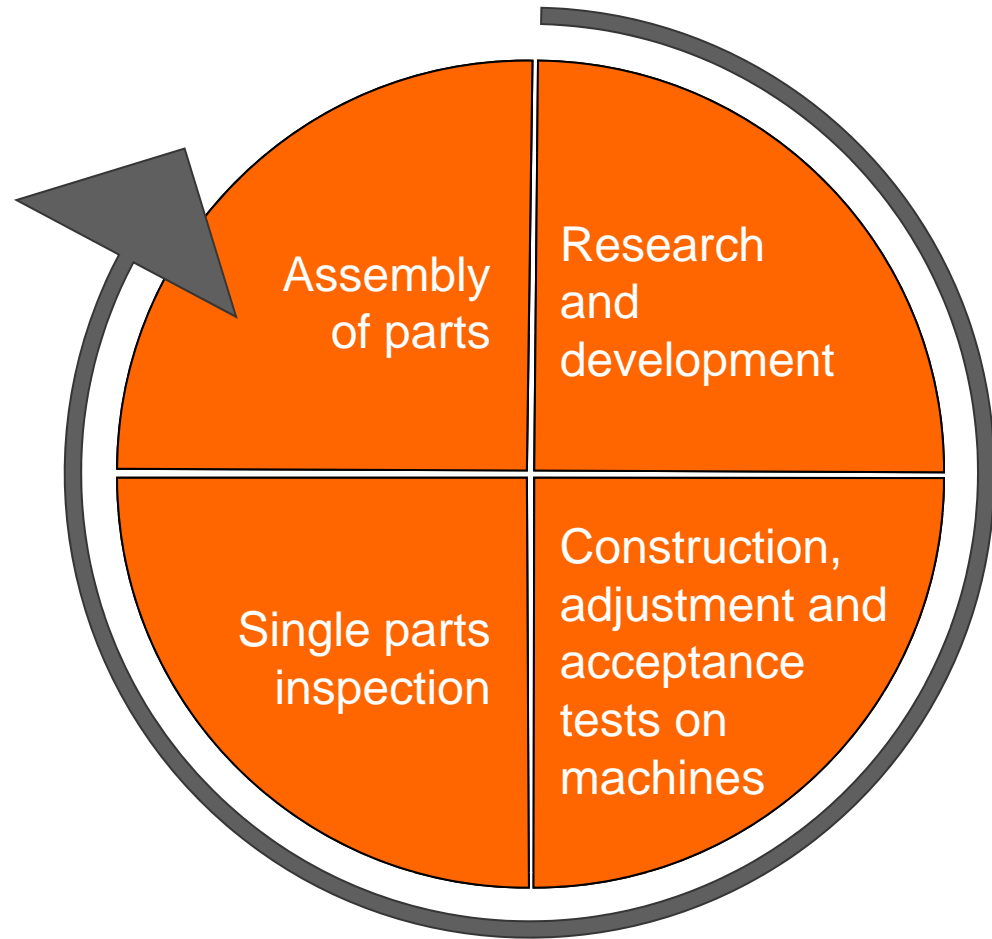
## ■ Proofing industrial products' geometries using mobile measuring equipment

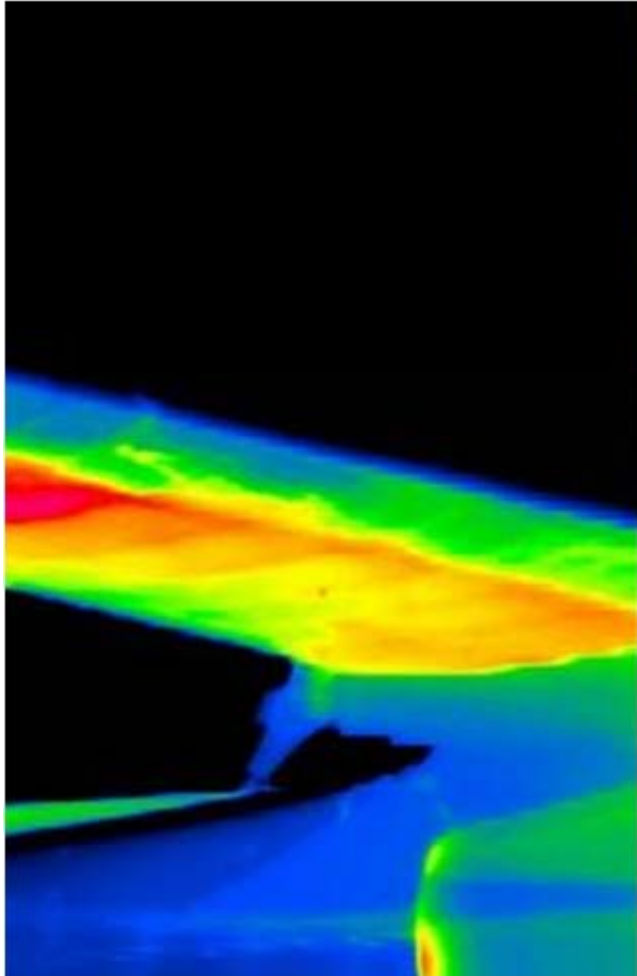
- Metrology is the high-precision proofing of products' geometrical properties. It doesn't matter if the part to be inspected has a size of 160 millimetres or a length of 160 metres – even bigger objects can be measured. Thereby we achieve accuracies (depending on the device's size and environmental conditions) up to a few 1/100mm. The whole equipment is mobile so the measurement can be taken where it is needed worldwide, e.g. directly within production. This mobility sometimes makes quality controls possible in the first place and / or reduces times and costs.



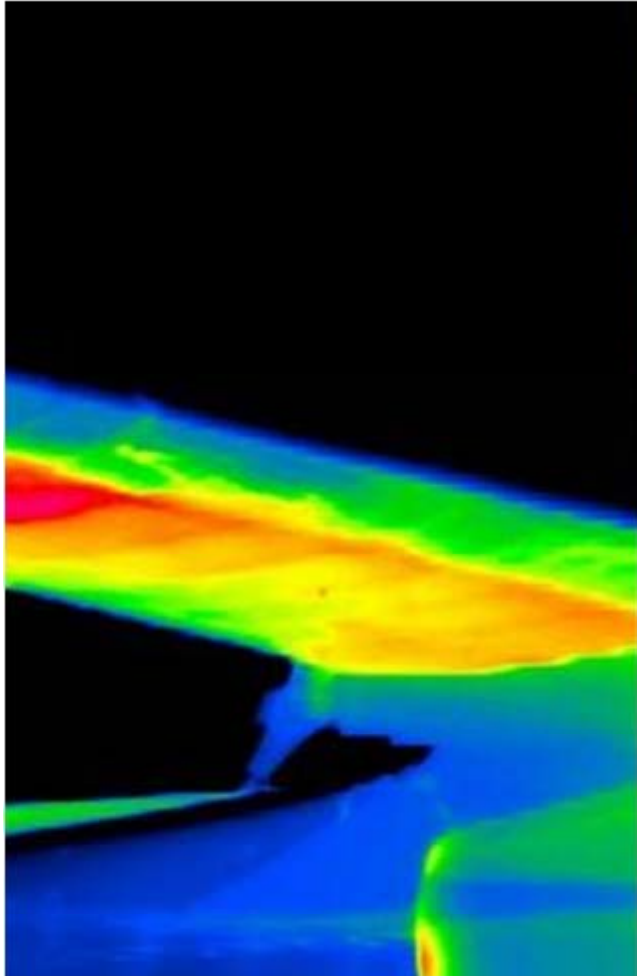
### ■ Put simply: we measure points

- Every object can be fragmented to a sequence of points. It is simply a matter of points-spacing or grids-meshing to collect enough information/points to describe an object digitally. We live in a 3D-world so the measurements should not be merely planar in two dimensions but also fully three dimensional in space.





- Metrology within research and development is important to
  - avoid defective goods later on
  - quantify and qualify which deviation follows from which production step
  - figure out variations under extreme conditions
  - validate processes
  - check scientific theories

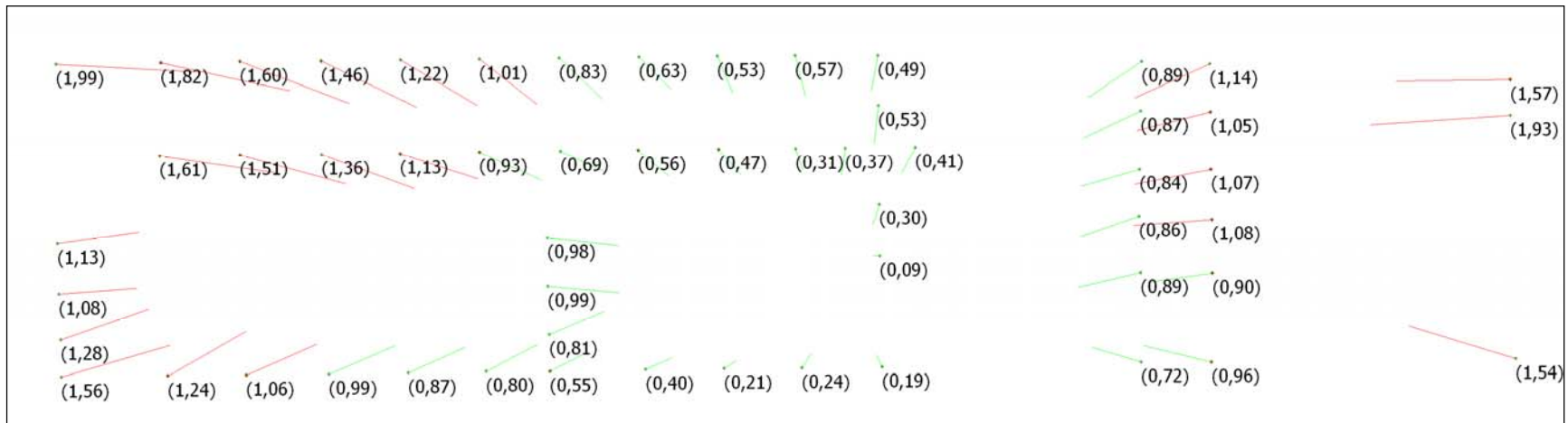


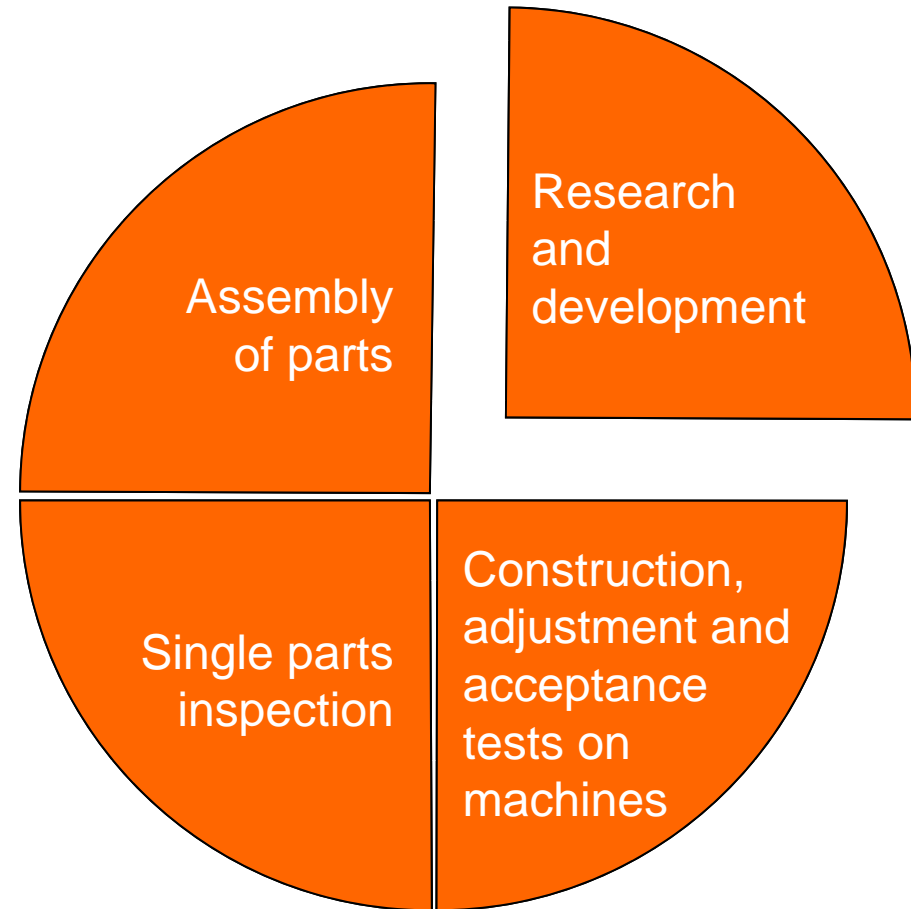
### ■ Behavior of CFRP during the autoclaving process

- CFRP is THE material of the future in the aircraft industry but is also interesting for automotive, wind energy and shipbuilding (lightweight, firm, low thermal expansion, durable, damping etc.)
- But CFRP-parts are extremely expensive and complex in manufacturing
- Manufacturing process effects shrinkage in dimension and thickness
- Displacements by melting resin



# RESEARCH AND DEVELOPMENT



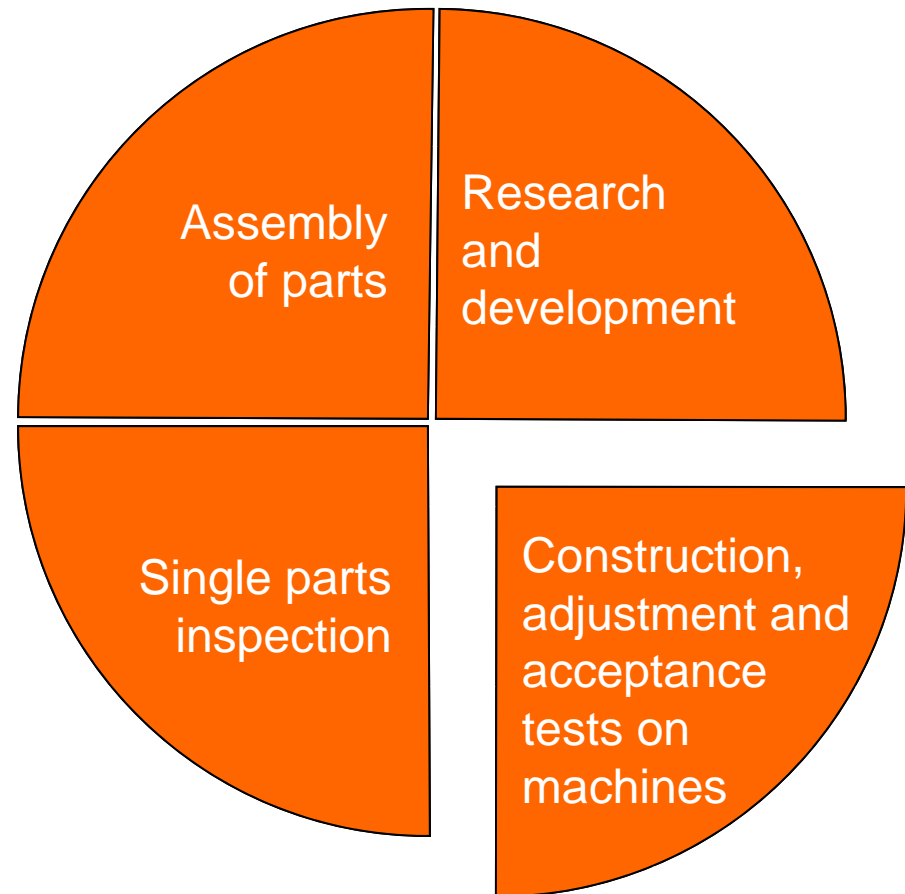


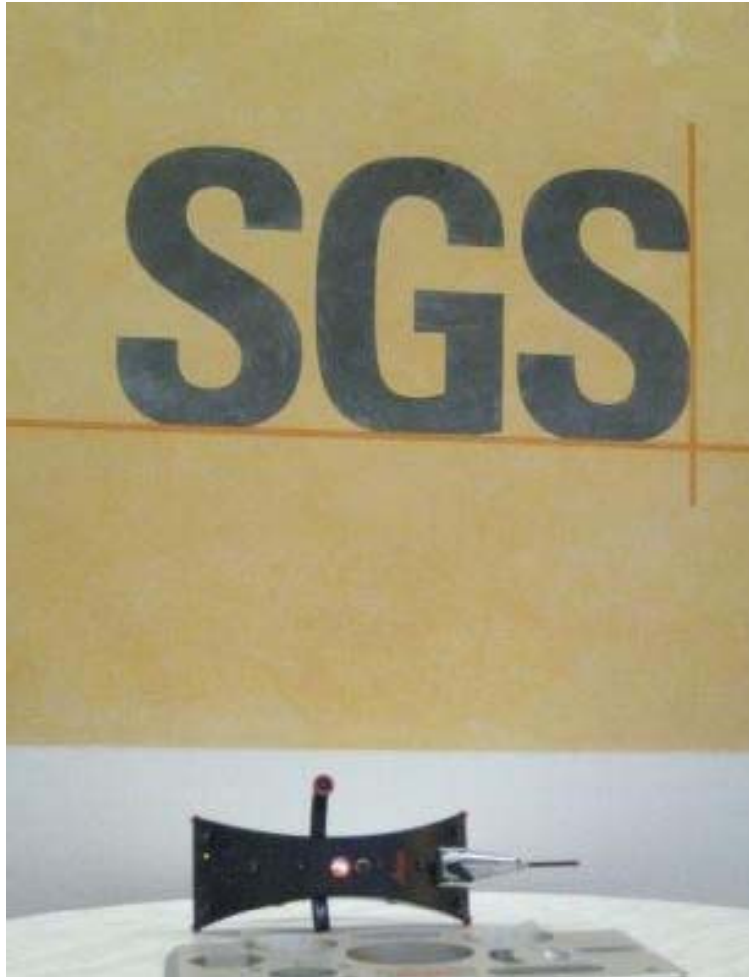


## CONSTRUCTION, ADJUSTMENT, ACCEPTANCE TEST

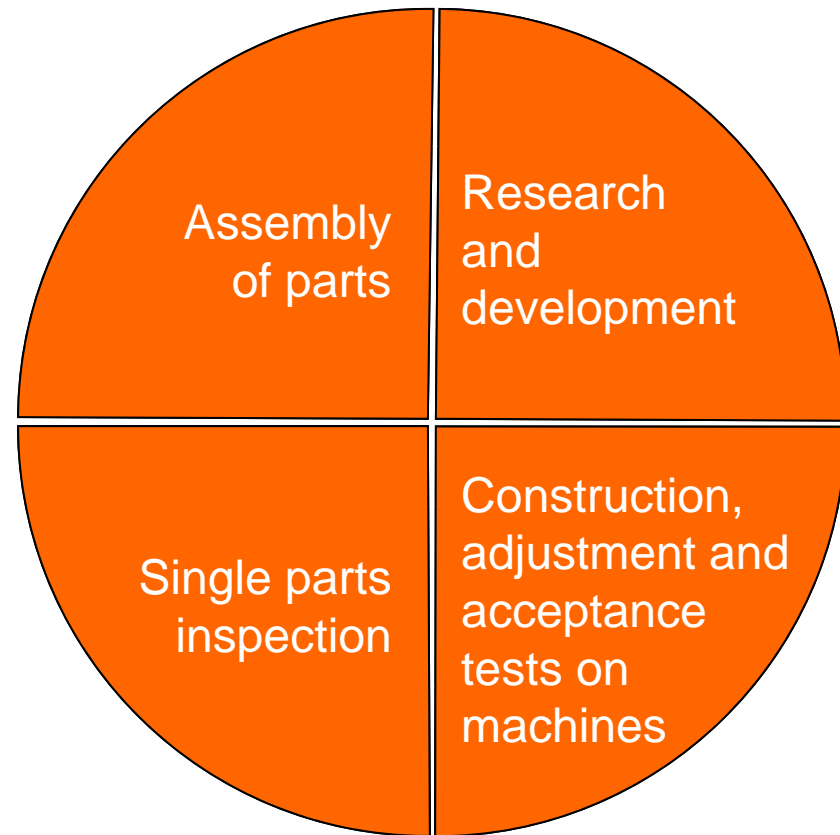


- Within this step metrology is checking
  - if production machines are located according to factory's layout
  - if machine components (supporting brackets, pins, rails etc.) are well-positioned
  - if plants are working correctly
  - how robots are moving towards nominal position
  - if production moulds and tooling profiles are within tolerance





- A single part – a lot of geometries to be checked. How accurate is a produced module? The single parts inspection gives certainty about the geometrical quality.
  - Storage of part to avoid unintended flexion
  - Position of bonded parts
  - Milling of outlines
  - Drilling positions and e.g. diameters
  - Surface milling (planarity or special profile)
  - Shape of the part
  - Angularities
  - Ascertaining of distances

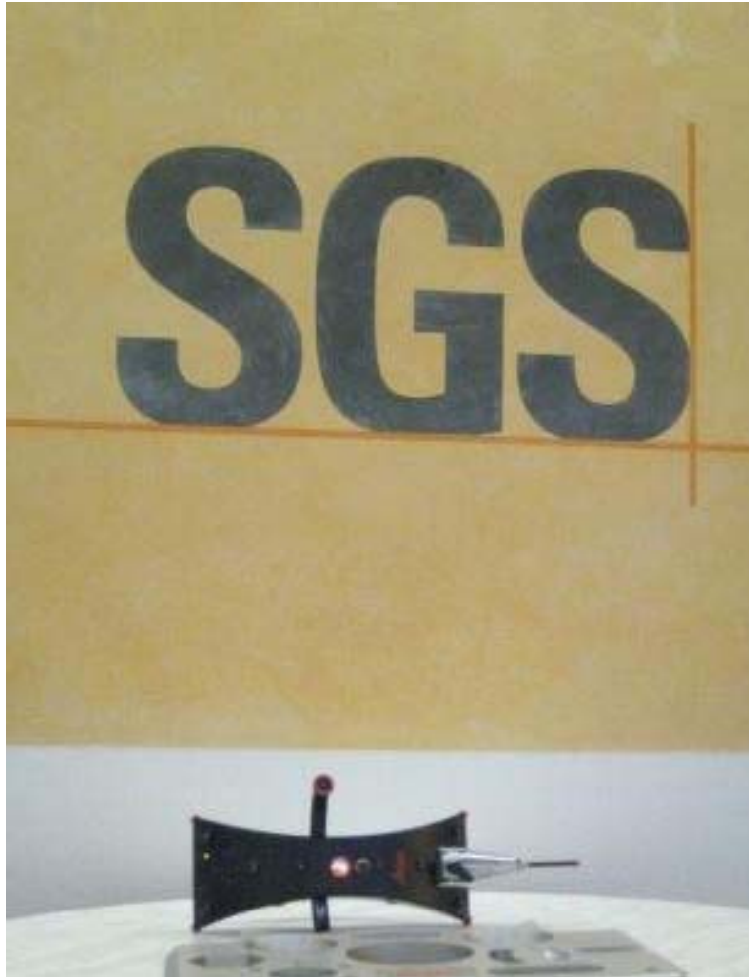




- Metrology helps in assembling parts accurately. Up to this point everything fits perfectly and functions smoothly – in theory. However, when assembling parts, inexplicable gaps do sometimes occur. Metrology helps in avoiding / figuring out / eliminating the cause(s):
  - Inspection / adjustment of connecting points, guidings and coupling flanges
  - Monitoring the process of integration
  - E.g. fault tracing

# SGS

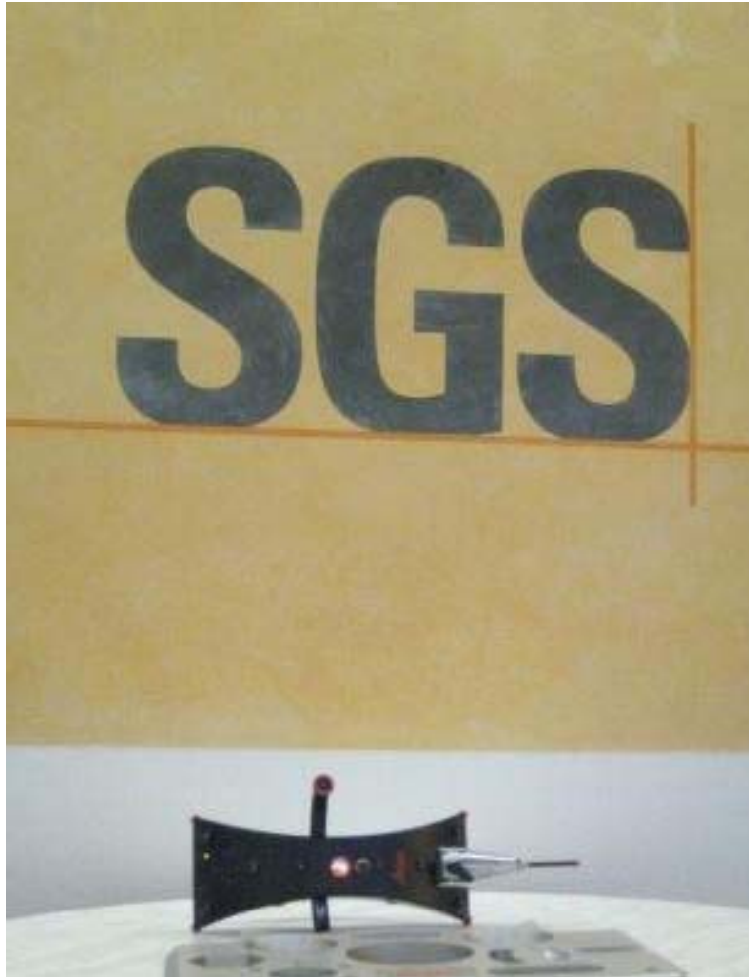
## WHY SGS? – YOUR BENEFITS



- You are not constantly concerned with high-precision geometrical checks?
- You do not want to invest in costly equipment and
- develop know-how which would be only occasionally used?
- **We take care of those measurements which are not a part of your core business.**

# SGS

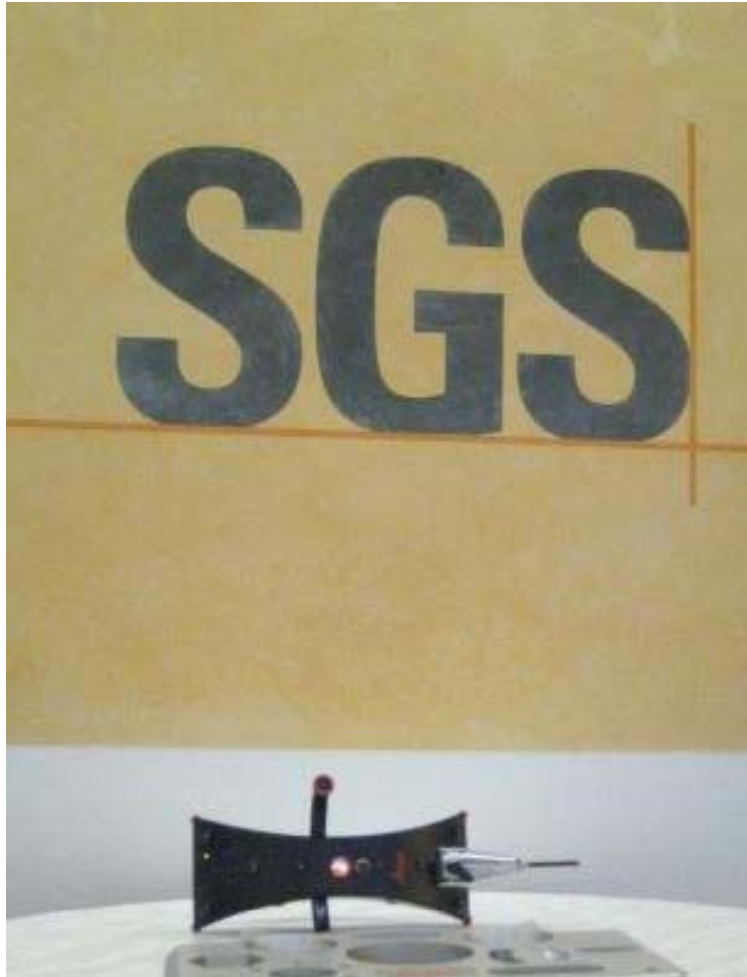
## WHY SGS? – YOUR BENEFITS



- You would like certainty?
- We take care of those measurements which are not a part of your core business.
- Our timely intervention helps you to exclude sources of error, deficiencies, and their subsequent costs

# SGS

## WHY SGS? – YOUR BENEFITS

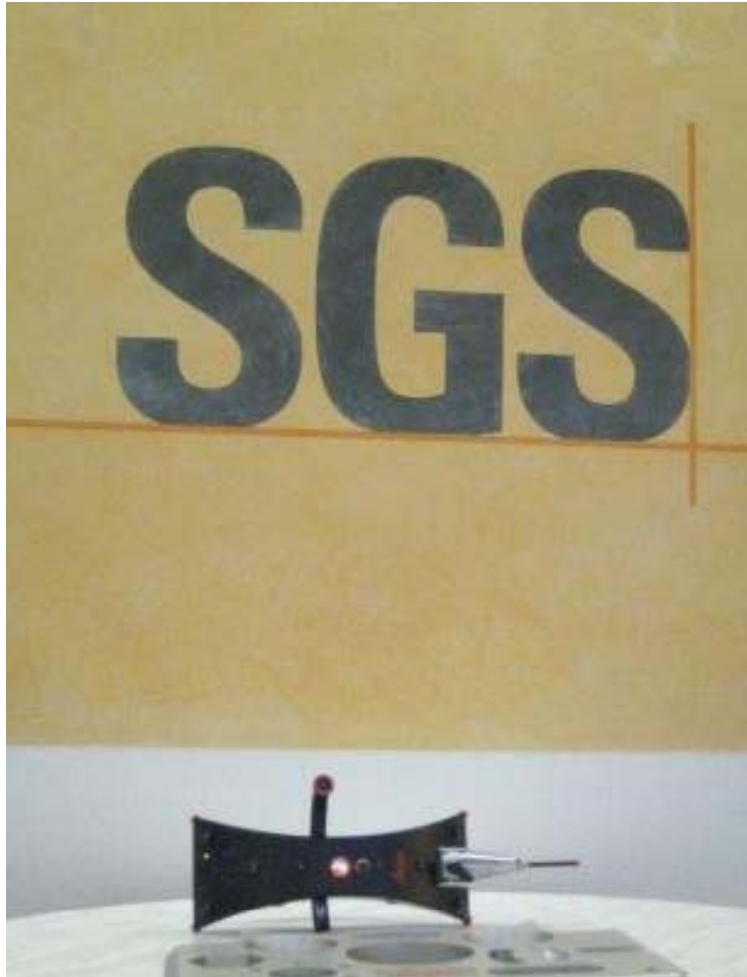


- Your employees need to acquire or further develop skills in the area of mobile 3D measurement technology?
- We take care of those measurements which are not a part of your core business.
- Our timely intervention helps you to exclude sources of error, deficiencies, and their subsequent costs
- In-house training by experienced technicians saves time and money.



# SGS

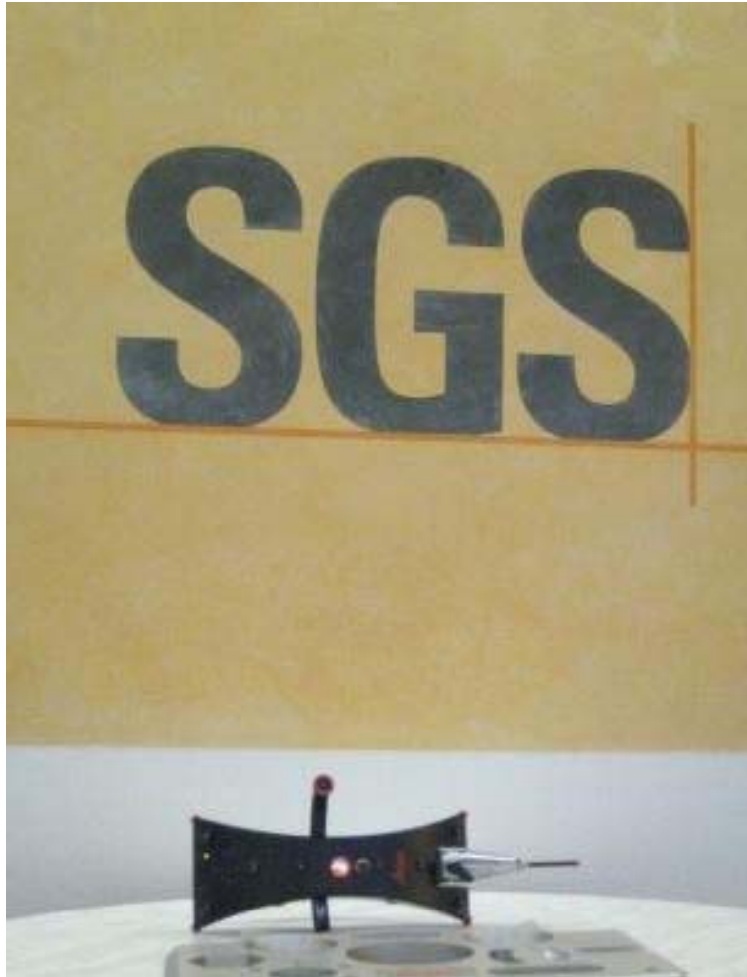
## WHY SGS? – YOUR BENEFITS



- You need support in the short-term and also the long-term bridging of staff shortages?
- We take care of those measurements which are not a part of your core business.
- Our timely intervention helps you to exclude sources of error, deficiencies, and their subsequent costs
- In-house training by experienced technicians saves time and money.
- Our flexible employees are at your service, whenever and wherever they are needed.

# SGS

## WHY SGS? – YOUR BENEFITS



- Your company products and processes need to be optimised?
- We take care of those measurements which are not a part of your core business.
- Our timely intervention helps you to exclude sources of error, deficiencies, and their subsequent costs
- In-house training by experienced technicians saves time and money.
- Our flexible employees are at your service, whenever and wherever they are needed.
- You want more? Then take advantage of SGS's accumulated wealth of multidisciplinary technical expertise.



- Development of measurement and analytical concepts for A380, A400M and A350
- Single parts inspection of
  - Wing covers A350 / A400M
  - VTP shells A300 / A310 / A330 / A340 / A380 / A400M
  - VTP spars A380 / A400M
  - VTP ribs A380 / A400M
  - Flap shells A318 / A321 / A380
  - Flap spars A380
  - Stringers A400M
  - Pressure bulkheads A330 / A380
  - Diverse test parts

# SGS

## EXPERIENCE WITHIN AVIATION INDUSTRY



- Inspections / adjustments / acceptance tests on machines
- Periodic inspections
- Training of AIRBUS staff members



## OUR AREAS OF ACTIVITY

### AVIATION



e.g. quality assurance in single item production.  
This mainly involves geometric testing following mechanical processing (contour milling, hole patterns, surface milling, etc.), assembly checks, but also the analysis of material performance during the production process (especially CFRP).



## OUR AREAS OF ACTIVITY

AVIATION



SPACE



e.g. testing satellites in a space simulator, including testing the geometric performance of components under extreme conditions.



## OUR AREAS OF ACTIVITY

AVIATION



SPACE



AUTOMOTIVE



e.g. support in design model construction. Large individual parts of a prototype are manufactured and assembled here. As the optical impression with gaps between the components is, among other things, crucial for aesthetics, high precision is required during assembly. Of course, industrial measurement is also required when starting up new series and in the general production process.



## OUR AREAS OF ACTIVITY

AVIATION



SPACE



AUTOMOTIVE



SHIPBUILDING



With regatta yachts, it's all about optimising geometric properties, as in Formula 1. Symmetry is the magic word. Position, deflection and anchoring the masts are of decisive importance.

In the case of large freight ships, the assembly of the individual hull segments needs to be checked.





## OUR AREAS OF ACTIVITY

AVIATION



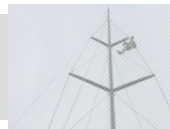
SPACE



AUTOMOTIVE



SHIPBUILDING



WIND POWER



e.g. increasing the performance of wind turbines by optimising rotor blade geometry. The moulds used to manufacture the blades are measured. The complete rotor blades can be tested for final approval and/or after transportation.

Additional measurement of tower flanges for levelness, roundness, parallelism and eccentricity.



## OUR AREAS OF ACTIVITY

AVIATION



SPACE



AUTOMOTIVE



SHIPBUILDING



WIND POWER



MACHINE CONSTRUCTION



The broadest area of application for industrial measuring, e.g. individual part testing, checking and adjustment of production equipment components and the identification of compensation parameters for the correct positioning of robots.



## OUR AREAS OF ACTIVITY

AVIATION



SPACE



AUTOMOTIVE



SHIPBUILDING



WIND POWER



MACHINE CONSTRUCTION



PLANT CONSTRUCTION



e.g. digitalisation of pipeline courses or complete interior measurements for factories. This can be necessary if, for example, a boiler plant needs to be replaced, the internal workings of a factory have “grown organically” and a new boiler needs to be fitted into the existing setup in the best possible way.



# OUR AREAS OF ACTIVITY

AVIATION



SPACE



AUTOMOTIVE



SHIPBUILDING



WIND POWER



MACHINE CONSTRUCTION



PLANT CONSTRUCTION





## CONTACT

Winfried Bruns  
Project Manager Metrology

Rödingsmarkt 16  
20459 Hamburg

Telefon +49 172 150 97 59

Fax +49 89 125 04 06 - 8536

E-Mail [winfried.bruns@sgs.com](mailto:winfried.bruns@sgs.com)

[WWW.SGS.COM](http://WWW.SGS.COM)

WHEN YOU NEED TO BE SURE

**SGS**