

# ProGeo 3D

The 3D photogrammetry solution for machine builders



# What advantages does ProGeo-3D offer you?

- A complete practical photogrammetry package including CAD-comparison at a very attractive price
- No third party software required:  
**Complete your measurement and reporting in one easy to use software!**
- Point Detektion accuracy up to 30 µm:  
**We can demonstrate this accuracy using an interferometer.**
- Measurement and analysis of deformation
- Analysis of movement in 3D
- Positioning in 3D
- Tolerance analysis
- Target Performance comparison
- Easy quality check
- Cost efficient
- Simple – handsome Quality control
- Reverse Engineering
- Inclusion of Tachymeter, and Laser tracker co-ordinates
- Customisation is welcome
- We have the capacity to make customer specific changes quickly and at very reasonable cost
- Mechanical engineering expertise: 20 years of experience in the manufacture of high precision laser measurement tools down to 1µm accuracy
- We offer comprehensive measurement services
- Easy to learn and use

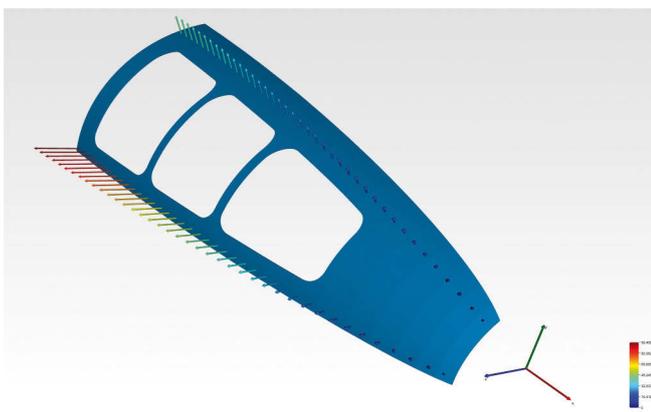


Fig. 1: Deformation on hull of a ship

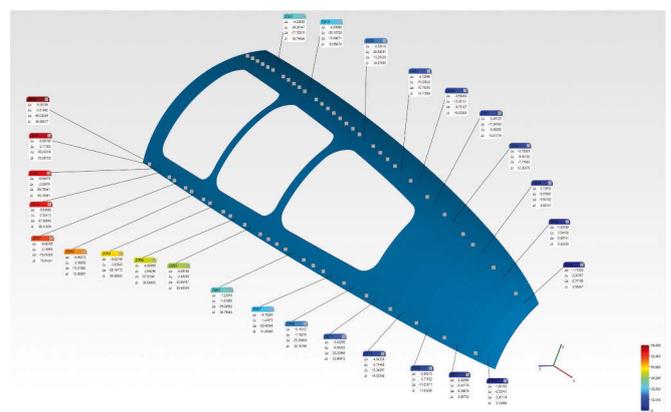


Fig. 2: Coordinate evaluation



# The issue of accuracy

The guide lines VDI 2634 is currently the best help we have in the search for a universally agreed definition of procedures and criteria with which the accuracy of photogrammetric systems should be judged.

The VDI 2634 defines a cube containing 7 reference rods. As illustrated in Fig 5. This cube has the dimensions 2m x 2m x 1.5m. Each Reference Rod has 4 or 5 referenced points. The distance separating the points should be known an "constant" with a precision above and beyond that achievable by photometric methods (ideally within a few Microns).

## At the end of the day:

The accuracy of a photogrammetric system is then defined by the accuracy with which the systems locate these reference points in this reference cube. Typically the results are presented as deviations (Y Axis) with reference to the reference length as depicted in Fig 6.

In fact the achievable accuracy for any given application of this technology is dependent on a great deal of details.

## For example:

The object form, The camera's resolution. The camera's optical mechanical und thermal stability. The number of photos taken, the orientation of the photos. The position and accuracy of the reference rods. Etc etc ...

In particular the visibility of the points from various incident angles can have significant influence on the achievable accuracy for a specific measurement.

For those who want to know more we recommend reading "Informationen zur Genauigkeit von photogrammetrischen Systemen" you will find at Luhman, page 111 (<http://dggk.badw.de/fileadmin/docs/c-645>).

It is worth remembering that the size and accessibility of the object to be photographed has a significant impact on the achievable accuracy. Therefore when measuring large objects it is often using to introduce a few points of know position into the image. These reference socalled external reference points can be measured using alternative technologies.

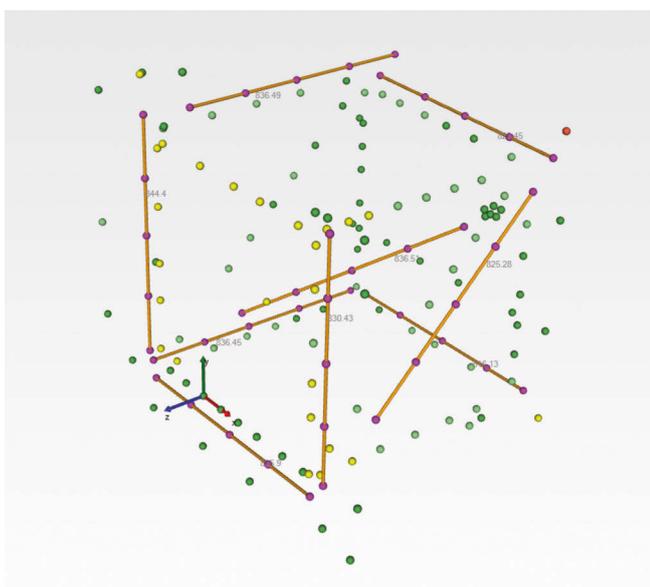


Fig. 5: Certified "calibration cube"

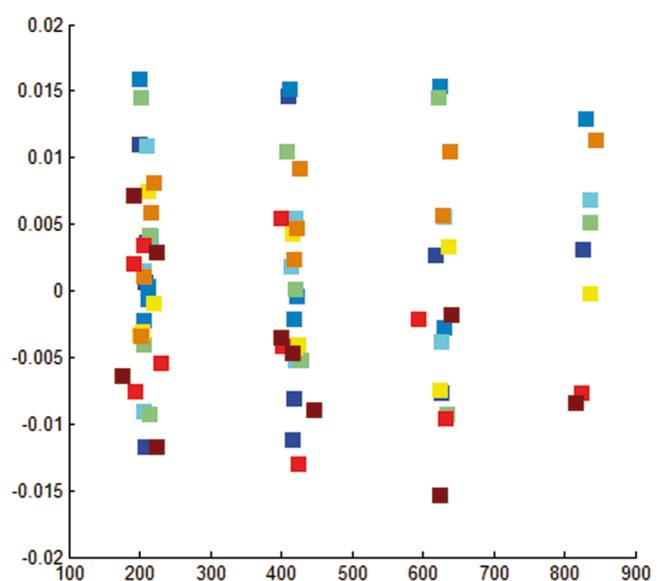
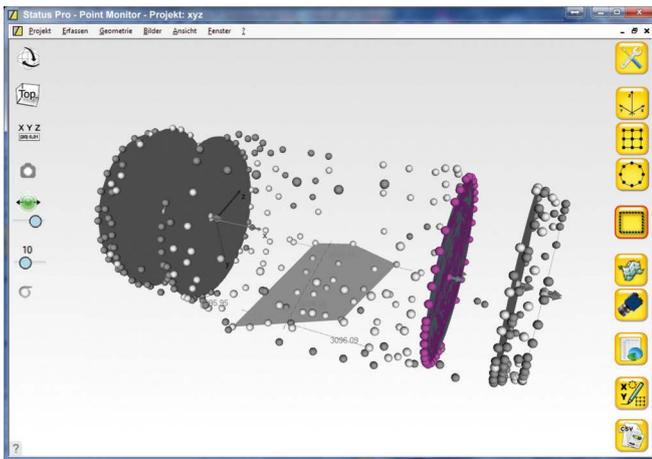


Fig. 6: Evaluation of the measurements done with the ProGeo 3D 30 System related to the VDI 2634

# Using the Point Monitor Software



For 20 years it has been Status Pro's central goal to make equipment which can be used by machine builders on-site. Typically our customers have a multitude of responsibilities on-site and "measurement" is just one of these functions. Therefore we strive to keep it simple.

How many reference points are required and where to place them requires some training and experience. However if the measurement-object remains similar in shape and form this can be learned quickly. Taking the photos is quite straight forward and this is supported by the software. The question is always "Was that sufficient?".

Having taken the photos we automatically end up with a cloud of points. What happens next depends on what information we require from these measured points. Measuring surfaces is usually very straight forward and a report can be generated immediately.

The Point Monitor software supports the measurement of much more complex application. We can group points together and make best fit geometrical forms. We can call up the characteristics of these forms. We can also compare the nmeasured forms with CAD diagrams. Point monitor is a very versatile geoetriuc package which is available in 3 steps.

## Basic functionality

- Fully automatic point cloud analysis and reporting is possible.
- DIY Analysis is fully supported.
- Export of pointcloud in most current fiormats.
- Practically unlimited projet size 64bit-Technologie supported
- Standard- und extened calibration models
- Point quality monitoring
- On the job and integrated calibration
- System specified according to VDI 2634

## Geometrical functionality

- Flexible co-ordinate system definition
- Best fit surfaces, circles, cylinders, lines etc  
Characteristics of geometrical forms and there orientation in the point cloud.  
For example. Cylinder axis projection w.r.t center of circle.
- Automatic recognition of Point adapters, bores, sharp edges corners and many other characteristics.

## Deformation analysis

- Transformation of sevel deformation stages into co-ordinates or vectors
- Flexible definition of reference points
- Illustration of deformation as a vector field

## CAD-Comparison

- Import of CAD-Formats
- Visualisation of calculation of deviations to CAD references.

# ProGeo 3D

## Main application areas:

- Measurement of 3D Parts and Forms (large and small)
- Direct and immediate comparison with reference points or Rods
- Machine geometrical applications
- Measurement and positioning of machines in large spaces
- Reverse Engineering
- Deformation measurement under load or temperature changes

This software has been developed and refined according to customer feedback over a period of nearly 10 years.

Digital Camera technology has improved dramatically in this period.

The available materials for reference rods and points is also under continuous revision. The result of these developments is that this technology has moved out of the realms of aerospace and become a relatively cheap and practical technology for machine builders.

## The ProGeo-3D-System is available in several stages of extension.

	ProGeo 3D 10	ProGeo 3D 20	ProGeo 3D 30
Accuracy according to VDI 2634	300 µm	100 µm	30 µm
Camera	Nikon D3100	D7000	D800, also D3X by request
Stabilisation of objective	–	✓	✓
Reference scale	Carbon	Invar	Invar/Carbon
Adapter	–	✓	✓
Deformation analysis	–	–	✓
CAD comparison	–	–	✓
Combination with external measurements e.g. Tachymeter	–	–	✓
Geometrical data (distances, planes)	✓	✓	✓
Advanced geometrical data (cylinder, sphere)	–	✓	✓
Automatic quality assessment of the photographs	–	Standard deviation	Deviation, outer point, cutting quality
Calibration	default	default	picture variant
Amount of scales	1	1	unlimited

The ProGeo 3D system contains everything needed for measurements with highest accuracy.

### System content ProGeo 3D 30:

Amount	Item Number	Description
1	PRO 3D 30	Linearis3D standard photogrammetry license with:
1	BG 860010	Nikon D800 Camera (with accessories)
1	BG 860020	stabilized objective 24mm
1	BG 860030	Nikon SB-700 flash
1	BG 860170	Brunson scale 1 m
1	BG 860180	Target holder for Brunson-scale
1	BG 860200	Photogrammetry targets for Brunson-scale
1	BG 860080	Start cross
1	BG 860090	Case for camera and accessories
1	BG 860100	Case for the scale
1	BG 860110	500 adhesive coded targets
1	BG 860120	500 magnetic coded targets
1	BG 860130	2500 uncoded targets
1	BG 860160	Manual
1	IT 200700	Dongle Linearis3D software professional

This system has been optimized for the use almost all currently available passive reference points and codes. The adapters and codes are usually fixed magnetically or painted onto the surface to be measured.

The choice of adapter or reference point depends on the size and on the characteristics of the measurement object. The adapters and codes are recognized automatically by the software.

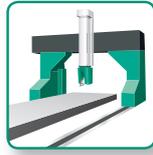
The required „Start Cross“, magnetic reference points and coded points are part of the delivered package. They can be printed or ordered at will.

Currently we recommend the Nikon D800 (Full format) with our own stabilized lens front end. Camera technology changes and improves very rapidly. We move with this development accordingly. Each system is naturally calibrated before delivery.

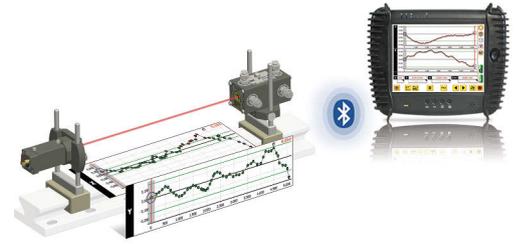


# A selection of our systems

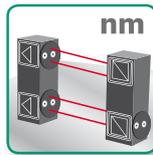
Linearity/  
Straightness



**ProLine**<sup>®</sup>  
by Status Pro Maschinenmesstechnik GmbH



Positioning/  
Linearity



**μLine**



Flatness/  
Level



**ProLevel**<sup>®</sup>  
by Status Pro Maschinenmesstechnik GmbH



Flatness/  
Level



**μLevel**



Flange  
Measurement



**ProFlange**<sup>®</sup>  
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