
We make 3D easy to grasp!

# 3D observer

ENGINEERING QUALITY WORLDWIDE

plasmo

# The 3D observer

A high-performance system which fulfill optical inspection tasks and automation tasks such as robot guidance or robot vision to a high degree of precision.

## Background

The 3D observer is an optical sensor system capable of fully identifying, capturing and measuring three-dimensional objects and their location in a space (in relative or absolute coordinates). It then supplies these data to a robot or linear axis system, for example, as commonly employed in many automated production processes.

The 3D observer provides information regarding the location, the 3D contour or gripping point of objects in the production chain. It is also capable of solving tasks which require the simultaneous use of both 3D and 2D optical technology.

The process is flexible, extremly quick and does not depend on the material or the colour and is almost independent from the surface.

Thanks to the high processing speed, this unique 3D scanning process allows 100% control of the production process.

## The challenge

Various technologies are available for the 3D capturing of objects. They differ in terms of their resolution, speed and suitability for stationary or moving objects. Time of flight-based systems offer resolutions in the range of millimetre, triangulation-based systems in the range of µm and interferometric methods in the range of nm. Our objective is to offer every customer an optimum high-speed solution with maximum resolution tailor-made for their specific application.

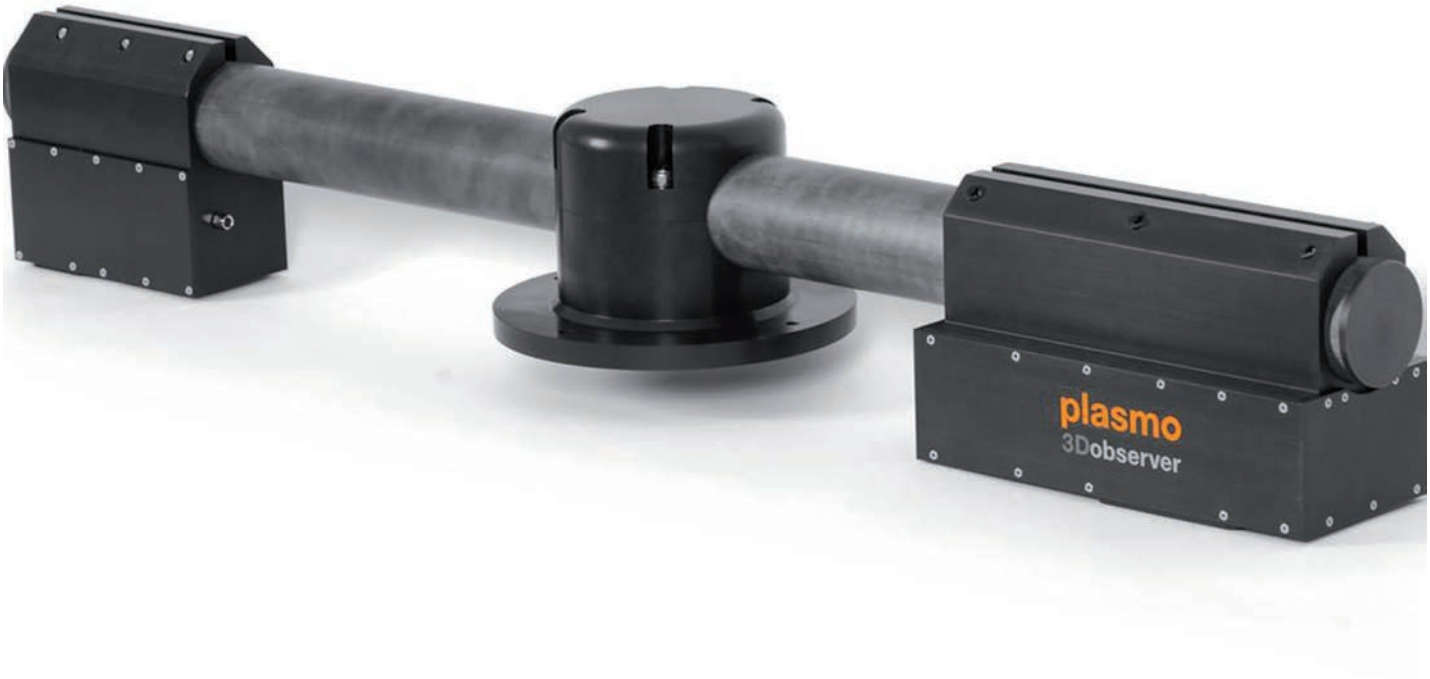
The specification for developing the plasmo 3D observer was to achieve a quick, precise sensor with resolutions in the µm range, suitable for both stationary and moving objects. The chosen technology is therefore based on laser triangulation. This also allowed us to build on the many years of experience gained from the plasmo profileobserver.

The plasmo 3D observer scanner technology allows the parts to be scanned effortlessly via a CAD interface following calibration in the workspace and without the need for any further parameterisation procedures.

The development of the plasmo 3D observer has enabled the creation of a sensor system which offers the quick, reliable identification, capture, measurement and inspection of components without long calculation times. The object data created in real time is compared with the current CAD data, the robot quickly positioned, and the parts inspected or rejected. We have thus successfully managed to master the 3D processing of such particularly challenging automation tasks.

## The plasmo 3D observer can be used anywhere

The plasmo 3D observer can be individually adapted to all eventualities in the workspace. It also has a very high resolution and is extremely fast. The scan area is flexible and easy to adjust.




*plasmo 3D* **observer***: The camera and laser unit are joined by a carbon tube. The system is always adapted to the individual application.*

*The plasmo 3D observer can be integrated easily in production environments.*

## Solution description

The 3D observer is an intelligent 2D/3D solution for image processing applications combined in one device. It is able of coping quickly with a variety of tasks to the highest degree of quality, e.g. the 3D measurement of a wide range of surface shapes, detecting the position of parts and determining a grip position. It is also capable of inspection tasks such as completeness monitoring. The 3D observer is suitable for many other types of tasks.

The 3D observer can perform a 2D surface inspection using an optional extension for operating in smaller workspaces. To do so, it also evaluates the 2D brightness information or colour information, for example, in addition to the 3D information. The plasmo 3D observer is therefore capable of performing a complete surface inspection in both 3D and 2D. This is the first time both functions have been combined in one system!

An additional software module also enables the system to acquire some "intelligence": the machine vision system compares previously supplied or simultaneously acquired CAD data to detect the position of each part. The data of the parts to be processed can be transmitted via an XML interface among other options (component geometry description) - even for a batch size of one. This means that any number of even completely unknown parts can be presented to the system. Just how this "small wonder" works is, of course, our little secret.

We'll only give this much away: the unknown parts are identified as such because their measured data can be compared to the CAD data of the parts.

**The plasmo 3D observer characteristics and benefits at a glance**

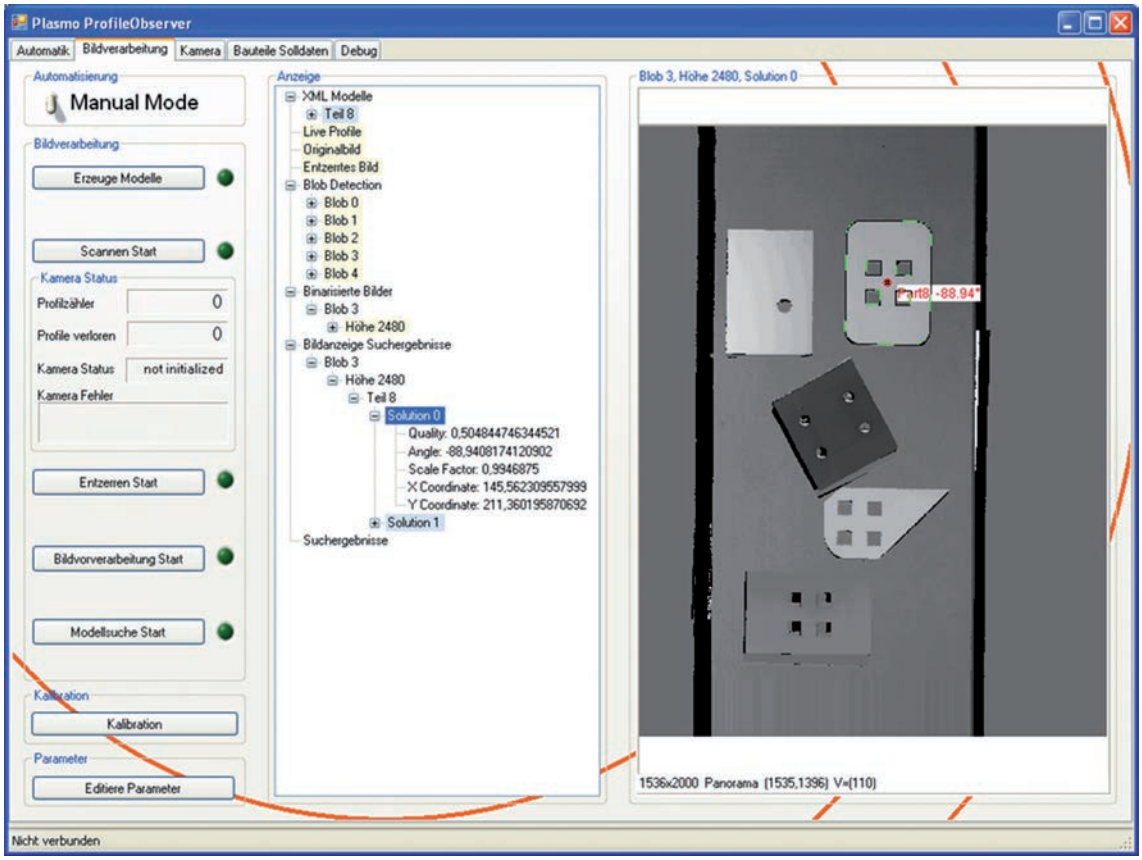
- Robot Guidance and Robot Vision System - robots learn to "see"
- Able to identify the smallest and largest of areas and workspaces
- Automation solutions, capable of gripping exposed parts
- Surface inspections
- High speed
- Quality inspection and documentation
- Faster, more reliable production cycles thanks to contactless inspection
- Freely scalable
- Calibrated to the pixel
- System for new parts can be configured via the CAD interface; can be used for batch size of 1
- Low-maintenance, calibrated overall system
- Reduction in production costs
- 2D/3D technology combined in a single system

The 3D observer is capable of performing all of these complex tasks because of the perfect combination of the three most important components:

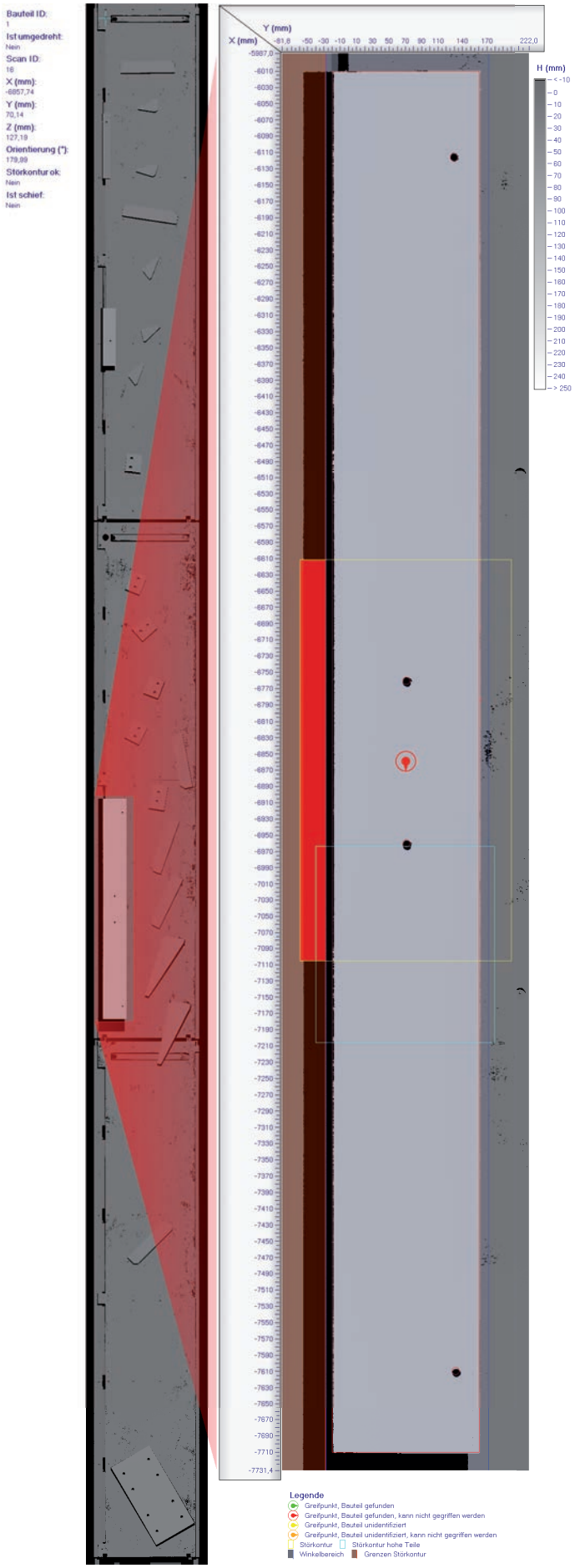
1. The special design of the plasmo 3D observer which consists of a camera and a line laser mounted on a non-warping carbon tube. The carbon tube guarantees sufficient warp-resistance and temperature stability.

2. The precise alignment of the optical components and camera sensor. These parts of the plasmo 3D observer are always adjusted to meet the specific job in hand to ensure the correct triangulation angle. Maintaining the Scheimpflug principle allows the greatest possible depth of focus.

3. A dedicated calibration piece is produced for every application. The system can then be optimally adjusted to the customer's workspace which makes it possible to implement any test equipment capability requirements.




*Screenshot of the plasmo 3D* **observer** *software. (An english version of the user interface is also available.) The system identifies the various components and the data are passed on along the production chain, e.g. to a robot or a linear axis system.*




*Screenshot of the 3D observer software. Detailed visualization of a component.*

# Technical specifications

| Basic data | |
|---|---|
| Working distance | Freely scalable |
| Object surface | Matt to shiny |
| Number of camera pixels | 1,536 x 1,024 |
| Resolution | See following illustrations |
| Detectable object shape | All shapes on an individual basis |
| Sampling frequency | 1-5 kHz |
| Non-warping carbon tube | Optional |

| Lighting | |
|---|---|
| Laser class | 3B |
| Lighting | Laser, red, 660 nm |
| Laser MTBF | 40,000 - 60,000 hrs |

| Dimensions / connectors / weight | |
|---|---|
| Operating temperature | 0°C - 40°C |
| Storage temperature | -20°C - 50°C |
| Air humidity | 70% non-condensing |
| Shock resistance | 2 g, 3 x 6 robot directions |
| Vibratory resistance | 2 g, 58 Hz - 150 Hz |
| Camera module supply voltage | 24 V |
| Lighting module supply voltage | 5 - 24 V |
| Bar tube dimensions | Depends on field of view |
| Housing material | Anodised black aluminium |
| Protection class | IP 54 |
| Connectors | Harting, differential mode plug-in connector |
| Camera module weight | 2.5 kg |
| Lighting module weight | 2.5 kg |
| Camera bar weight | 3 kg |
| Safety glass material | Antireflex-coated, flat pl |

| Communication and bus systems | |
|---|---|
| User interface | Windows HMI |
| Camera PC interface | Ethernet |
| Serial (RS-232, RS-422) | Yes |
| Bus system (via Gateway) | Digital I/O, Profinet, Profibus, etc. |
| Encoder interface | 5 V TTL |
| Maximum encoder frequency | 2 MHz |
| Robot interface | Available on request |



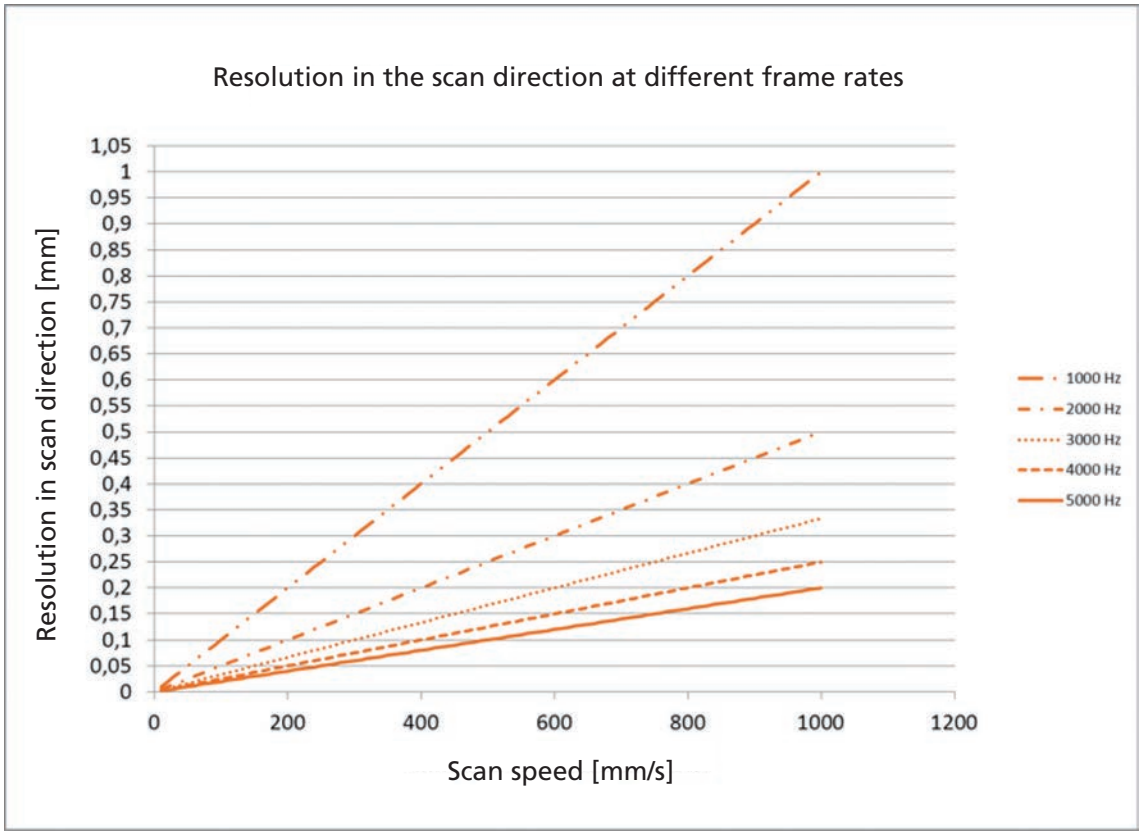



*Illustration of the resolution in the scan direction at different frame rates and scan speeds.*

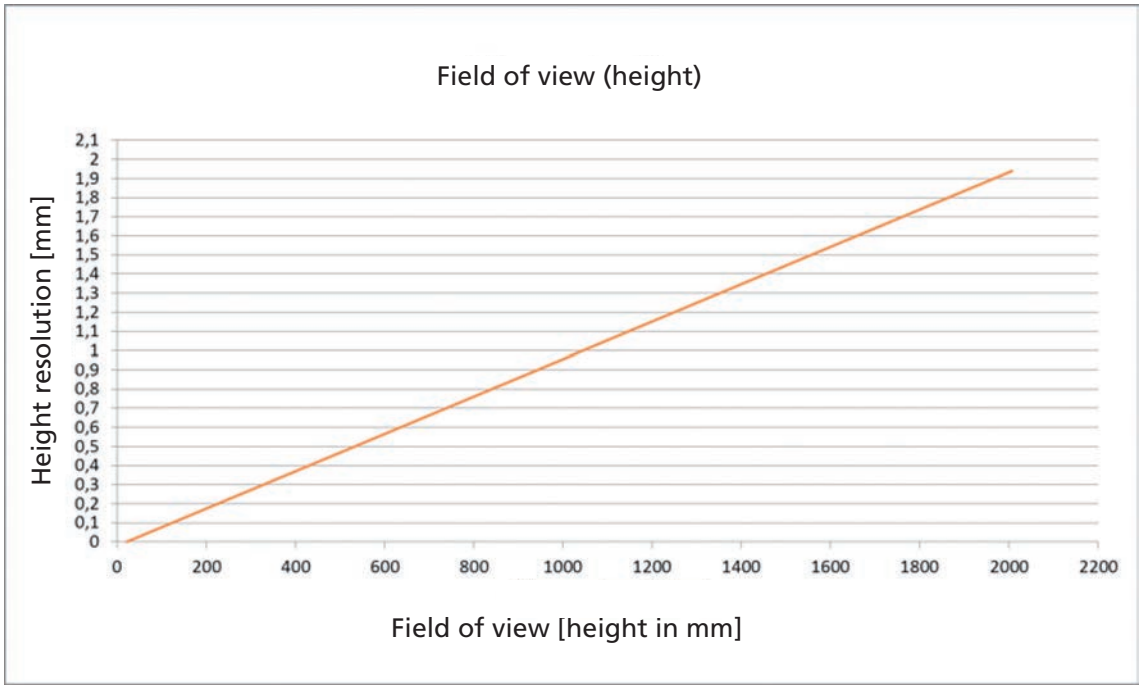



*Illustration of the height resolution in correlation to the freely adjustable field of view in height.*

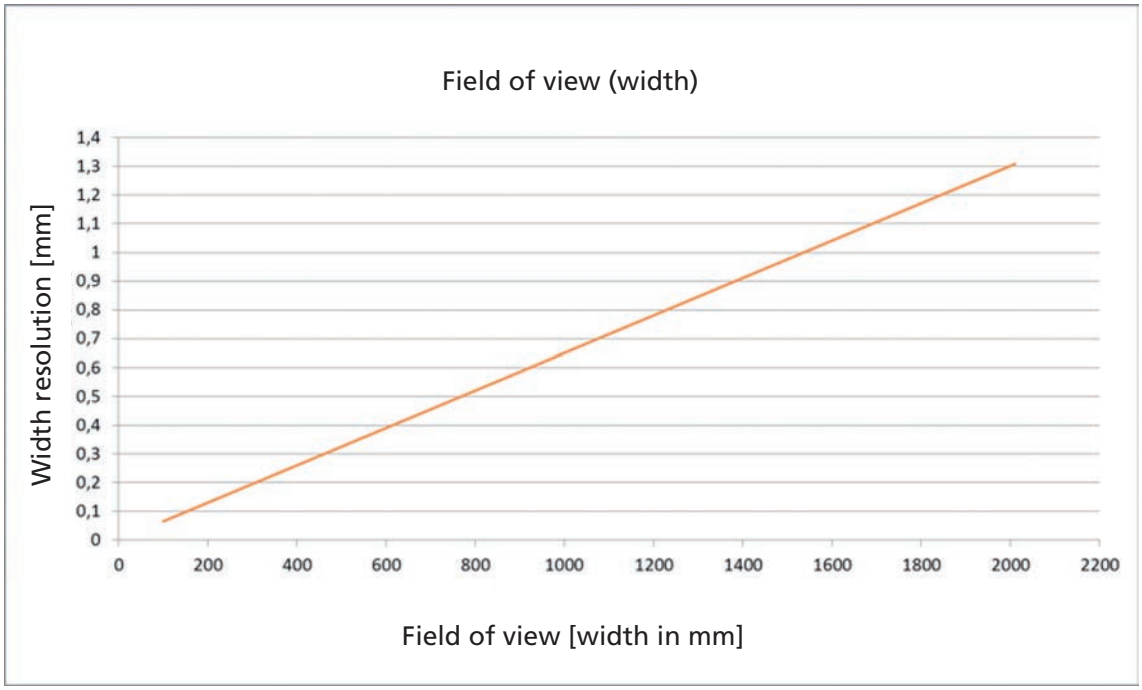
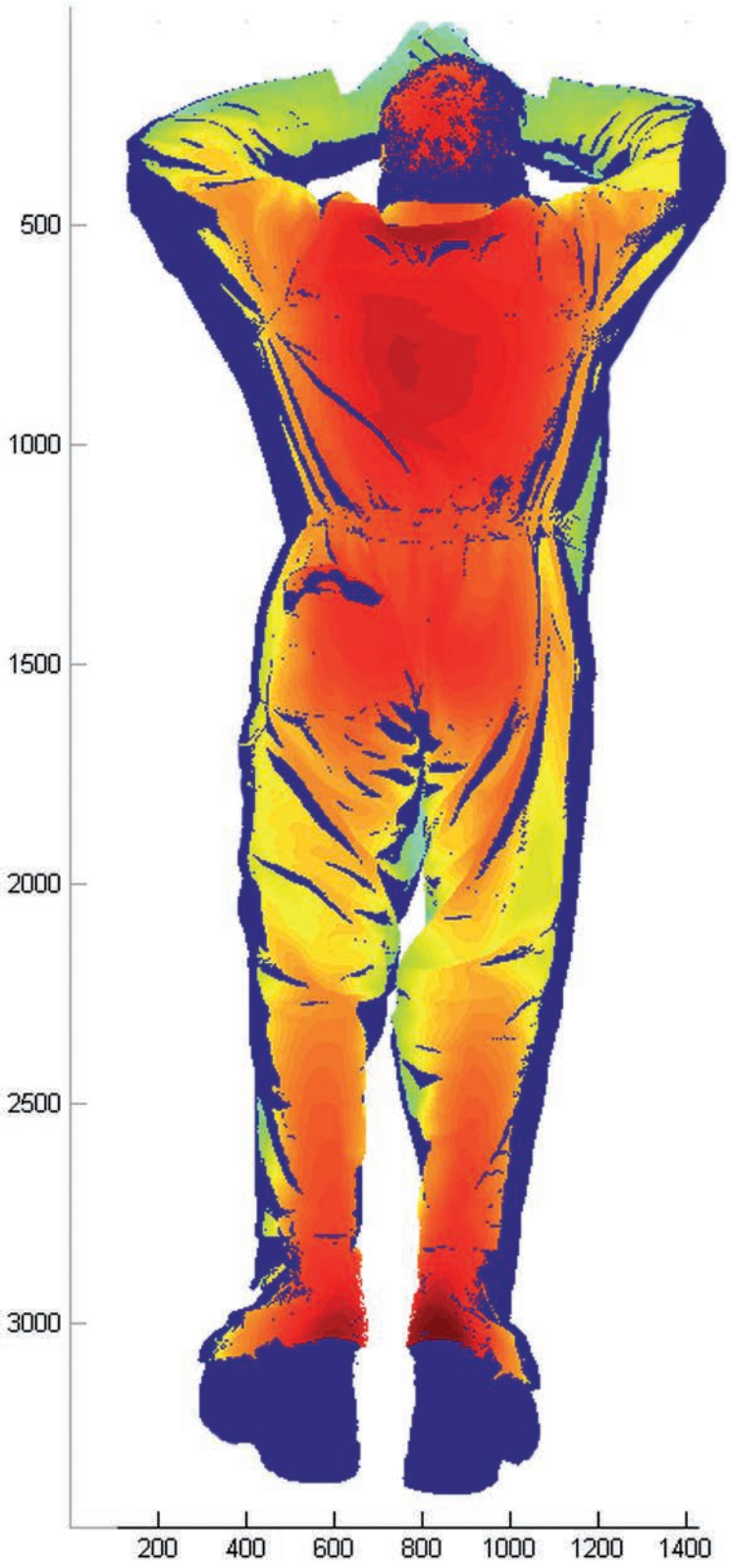



*Illustration of the width resolution in correlation to the freely adjustable field of view width.*




*3D scan of a person using the 3D* **observer***: different height values are represented useing different colors/false color representation.*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