

**Extract taken from the book  
'X-Ray Tomography in Industrial Metrology'  
which was produced with the technical  
collaboration of Werth Messtechnik GmbH**

### From Clinical CT to Industrial Measuring Machine

#### 1970's : First CT Machines for Medical Use

X-Ray Tomography, also known as computed tomography (CT), can be used to completely capture spatially extensive objects, including their internal structures for metrology purposes. The Austrian mathematician Johann Radon (1887-1956) laid the mathematical foundation for this process in the beginning of the 20th Century, with the Radon transformation that bears that name.

The use of X-Ray technology in the form of two-dimensional radiographic images has long been an established part of medical diagnostics. The Nobel Prize winners Allan McLeod Cormac and Newbold Hounsfield made substantial contributions to the development of 3D tomography machines for medical use. The first commercial machines were available in the 1970s. Today, this technology is indispensable in medical practice [1].

#### 1990's : Inspection Using X-Ray Tomography

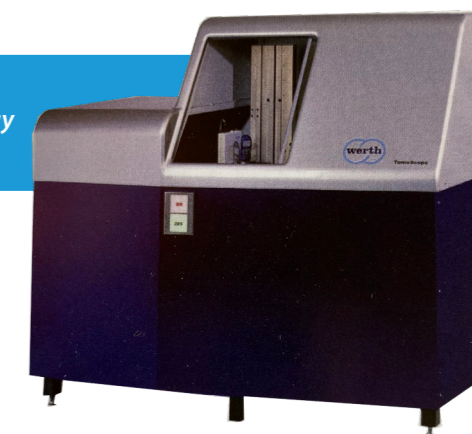
At the start of the 1990s, X-Ray Tomography was also being used more frequently for inspecting technical objects. Workpieces were checked for voids, inclusions and missing features. It became possible, for the first time, to inspect the internal structures of work-pieces in a non-destructive manner. Over time, special machines were developed for these new applications.

These machines were also being used for the initial attempts at determining work-piece dimensions using X-Ray tomography. The attainable accuracy, in the range of a few hundredths of a millimetre, was still very low. So, broad applications for metrological purposes were not yet possible. Especially the deviations of the measured dimensions from the absolute correct value were very large.

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**Fig. 1 : Werth TomoScope 200**  
The first coordinate measuring machine with X-Ray tomography – multisensor capabilities optional



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#### 2005 : First Coordinate Measuring Machine with X-Ray Tomography

The accuracy problem was overcome by a fundamentally new approach and the use of coordinate measuring technology. The first X-Ray tomography machine sufficiently accurate for industrial applications was presented to the public in the Spring of 2005 (Fig.1). This new class of coordinate measuring machine makes it possible to completely measure even complex components with several hundred dimensions and internal structures in a relatively short time of less than 20 minutes.

The accuracy ranges from a few microns for precision measurements. The use of these devices leads to significant acceleration of process chains and increases productivity for the user.



**More recent developments in CT -  
Dr. Ralf Christoph and Tristan Schubert with the  
TomoScope XS in 2017 (Above)**

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