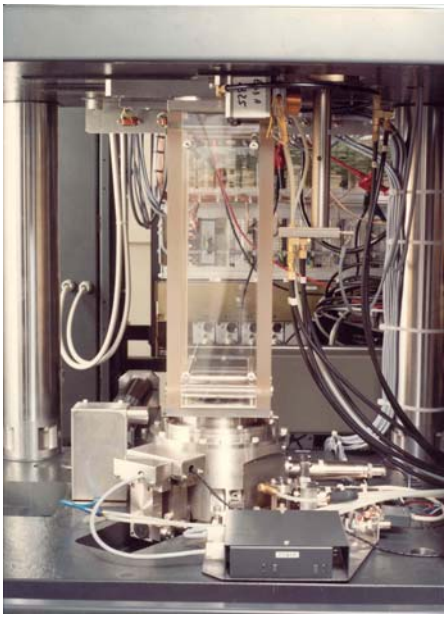
PAS 2000 – The First Machine

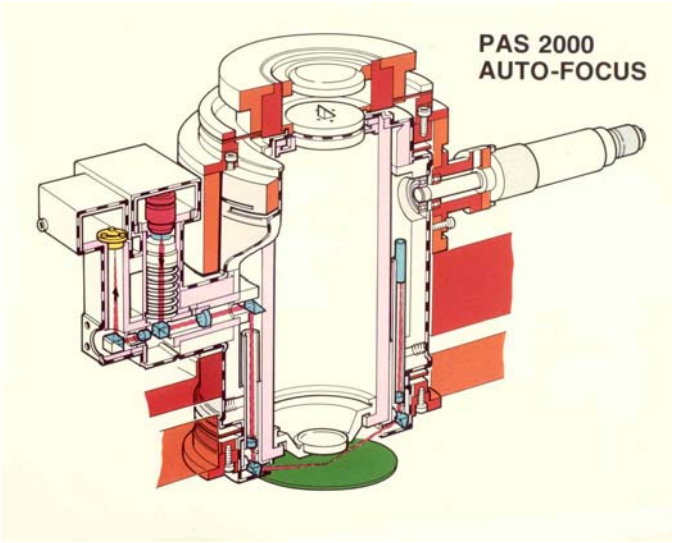
By Richard A. George

I was the project manager responsible for the development of the PAS 2000. The first PAS 2000 went to IBM Burlington, Essex Junction, in 1982, under management of John Babinski. The PAS 2000 (originally short for **P**hilips **A**utomatic **S**tepper) had an H-frame oil driven stage and a dual wavelength (g & h line) projection lens called the Super Tulipe. Steve Wittekoek (project leader for the Philips SIRE II machine on which the PAS 2000 was based) and I spent many happy business lunches in Paris with Cerco, the Super Tulipe lens maker! The PAS 2000 was the first commercially available stepper to use the Philips phase grating alignment system. 17 PAS 2000's in all were built by Philips and subsequently by ASML.

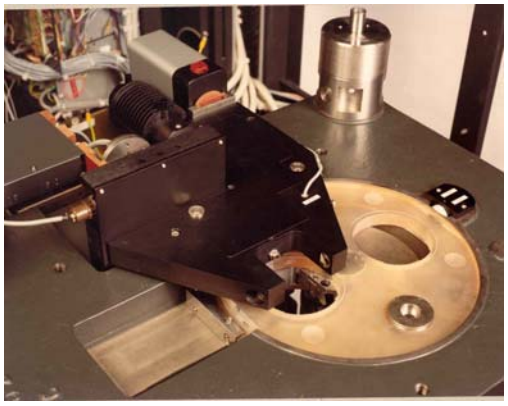


The PAS 2000 Super Tulipe lens from Cerco, is shown below.

This lens has a stationary collimator section (the long columns in centre of the picture) which projected an image of the reticle at infinity. This image was brought to a focus by the lower moving section of the projection lens. This vertically movable projection lens section tracked the surface of the wafer to maintain a sharp image on the wafer.



The lens had a laser focus system invented by Jan van der Werf of the Philips Research lab. See principles opposite, which shows the focus motor moving the lens (on the right) and the diode laser system used to track the wafer surface.



A little known fact is that the PAS 2000 had (and to my knowledge still has) the world's fastest reticle changer system. The reticle carrier supported two reticles and could change these reticles in about 1.5 seconds, measured flash to flash. See photo opposite. The two reticles were vacuum clamped to a zeroduur plate that very rapidly rotated 180° degrees to change reticles. The black box above the zeroduur plate is part of the alignment optics. This system was great for exposing wafers which had chip and test patterns - a

standard need then for mix and match to Perkin Elmer 1:1 scanners.

Steve Wittekoek was the project manager for the Philips Research Labs machine: SIRE II which was the forerunner of the PAS 2000.

The machine builders were Ad Brouwer, the mechanical designer of both SIRE I & II (on the right) together with Henk Bartelings who managed the SIRE II software & hardware designs

Lastly, another picture of the PAS 2000, together with Jan Gordon, one of the early development engineers on this machine.

The first PAS 2000 went to IBM Burlington, Essex Junction in 1982. It was installed there under leadership of Herman van Heek, who was the original project manager of the Philips SIRE I, before Steve Wittekoek took over & completed this machine.

I spent about three months in Burlington in '83 completing the final install and customer acceptance. I was accompanied there by Ale Sytsma from Friesland, a province in the north of the Netherlands. Ale, then about 24 years old, had never in his whole life ever been out of the Netherlands, so the three months in Burlington USA was quite an abrupt change in his life style!

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