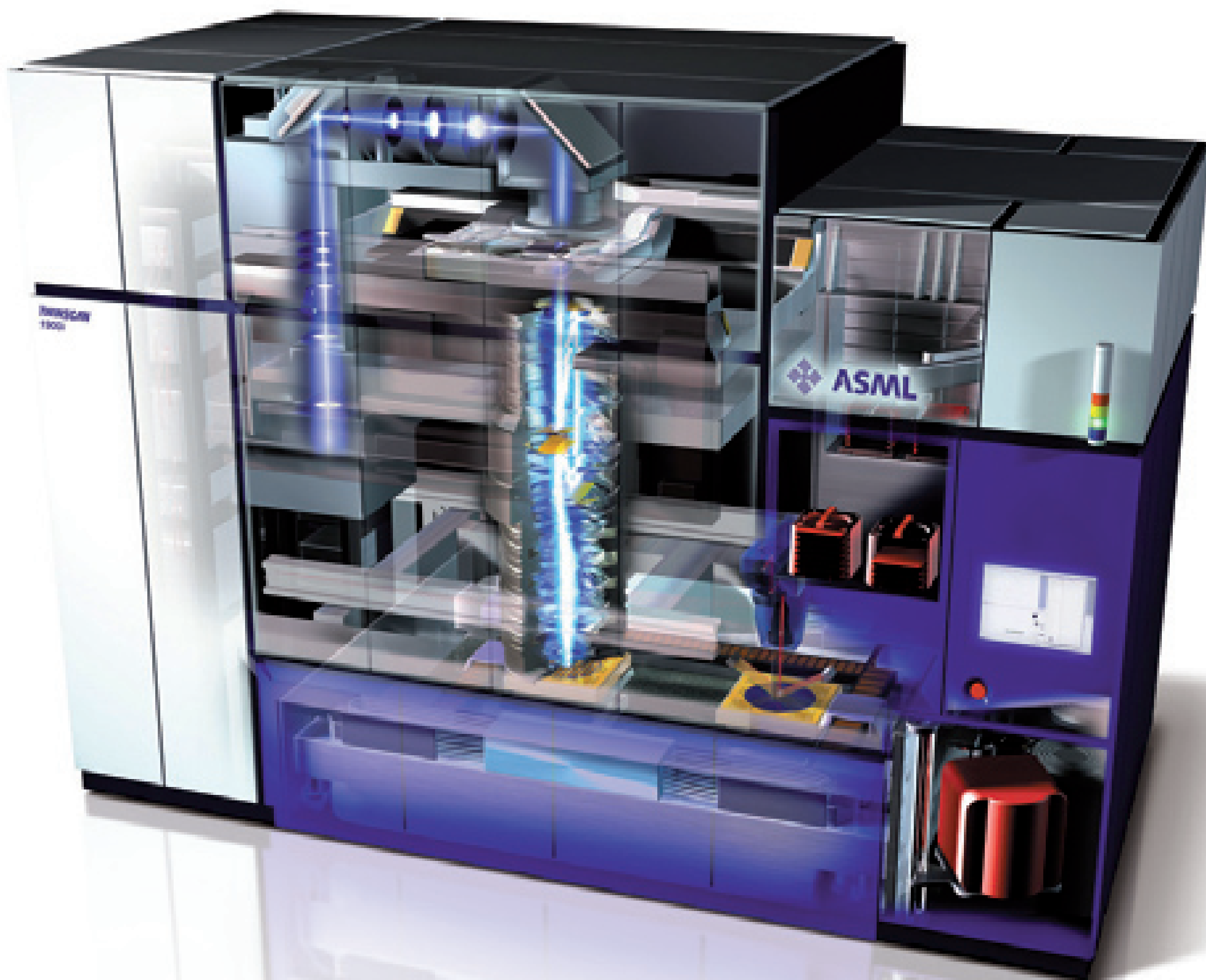
TWINSCAN XT:1900Gi

your route to 40-nm production

by Manfred Suddendorf

Abstract | ASML has launched the world's most advanced immersion lithography tool – the TWINSCAN XT:1900Gi. As well as an industry-leading NA of 1.35, the new system offers the highest throughput of any 300-mm immersion tool. It enables IC manufacturers to continue aggressive device shrinks for increased functionality at lower cost.



If you're reading this article, you won't need us to tell you how important feature shrink is. It improves chip performance, reduces product size and drives down the cost per function. To support your aggressive shrink roadmaps, ASML is launching the TWINSCAN XT:1900Gi. This fifth-generation immersion lithography system has an industry-high NA of 1.35, enabling volume production with half-pitch resolution of 40 nm and beyond.

ASML has been the technology leader in immersion lithography since 2003 when we launched our first immersion system, the AT:1150i. Each year since then we've moved the technology forward with new systems. And earlier this year we began shipping the XT:1700Fi – the industry's first 1.2-NA lithography system.

All these systems are built on the established TWINSCAN platform. The modular nature of the platform means that each new system is already mature and well-proven in the field – the only components that are redesigned are those that deliver the next step forward in lithography performance.

Proven catadioptric lens design

The XT:1900Gi features a Zeiss Starlith 1900i immersion lens. This is the largest-NA ArF lens available and at 1.35 NA, it pushes water-based ArF immersion lithography to the limit. Combined with ASML's Ultra-k_1 portfolio, which delivers the industry's lowest usable k_1 values, it enables half-pitch resolutions of 40 nm and below.

The Starlith 1900i uses the same in-line catadioptric (involving reflection and refraction) lens concept already successfully employed in the XT:1700i. Just as with the introduction of aspheric lenses for high-NA dry lithography, the addition of mirrors reduces lens complexity and size for hyper-NA immersion systems. Our catadioptric lens concept was deliberately chosen to be extendible to higher-NA systems, enabling a low-risk migration to smaller feature sizes.

ASML uses an in-line design for its catadioptric lenses. This results in a more compact, single-barrel assembly that provides greater mechanical stability and easier lens adjustment than folded systems. In addition, as in-line catadioptric assemblies have an even number of mirrors, you can use the same reticles as with the purely refractive assemblies found in today's non-immersion system. Such reticle compatibility between systems gives you more production flexibility.

It delivers a further 12% shrink over the XT:1700i

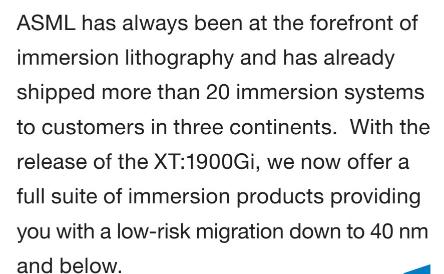
Evolution not revolution

Complementing the improved imaging performance, the XT:1900Gi features a number of enhancements to improve overlay. These include improved stage-position metrology and optimized thermal management. The result is a single machine overlay of just 6 nm. At the same time, the XT:1900Gi offers best-in-class focus control – an important consideration at such a high NA.

With its unique dual-stage approach, the TWINSCAN platform has always been a leader in productivity. The XT:1900Gi is no different. Thanks to enhancements in both measurement and expose cycles, it sets a new benchmark for immersion lithography with throughputs of 131 wafers per hour.

The forefront of immersion lithography

The XT:1900Gi is the most advanced immersion system in the industry with the highest NA and resolution. Ready for shipping in mid 2007, it delivers a further 12% shrink over the XT:1700i.



ASML has always been at the forefront of immersion lithography and has already shipped more than 20 immersion systems to customers in three continents. With the release of the XT:1900Gi, we now offer a full suite of immersion products providing you with a low-risk migration down to 40 nm and below.

XT:1900Gi specifications	
Numerical aperture	0.85 – 1.35
Resolution	40 nm
CDU	2.5 nm
Single machine overlay	6 nm
Throughput	131 wph (@125 exp per wafer)