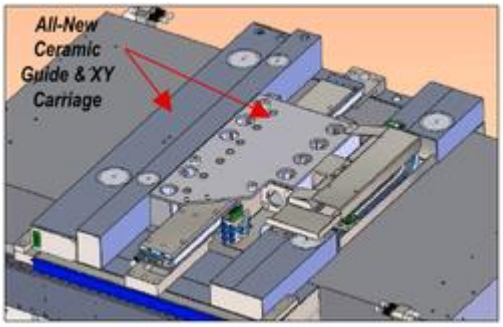
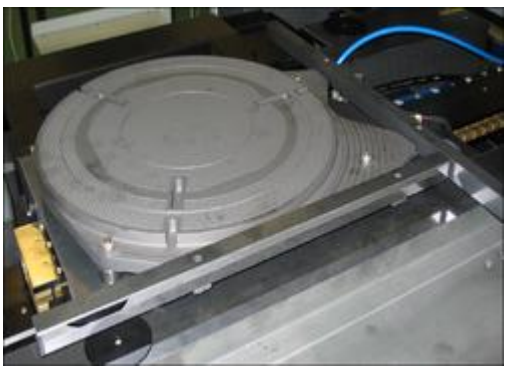
DynamYX DATUM Ultra High Performance Stage

The all-new DynamYX Datum achieves performance never before possible in a commercially available air bearing stage. Datum is the bi-product of Newport's continuous investment in advanced materials, proprietary fabrication techniques, and meticulous structural analysis and design. Our goal in creating Datum was to provide our customers with accuracy and throughput needed for today's most demanding applications as well as the ability to stay-ahead of tomorrow's challenges.
DynamYX Datum finds its heritage in the DynamYX 300 and GT stages where a simple three-piece architecture and designed-in precision have been satisfying demanding applications for the past ten years. A decade's worth of technological advancement brings to Datum a new, dynamically symmetric architecture constructed of a next-generation ceramic material with all-new micro-structure air bearings that, as in all Newport air bearing stages are directly machined in to the structure providing low-profile monolithic stage elements.

Full throughput performance of the DynamYX Datum stage is realized when configured with a ceramic chuck. Ceramic chucks offer lower mass and improved flatness compared with metallic designs. An added benefit of using a ceramic chuck on a DynamYX stage is that the thermal expansion coefficients of the chuck and stage are matched which allows for the chuck to be directly mounted to the XY carriage. This direct mounting provides for the flattest and most thermally stable wafer surface possible in a single plane stage architecture.
When extreme XY accuracy is required, linear encoders may be replaced with a two (XY) or three (theta) axis interferometer system. By combining Newport's expertise in ceramics and optical surface finishing we are able to provide a cleanly integrated interferometer mirror solution with excellent surface quality and dynamic characteristics. As in the case of the ceramic chuck, these ceramic mirrors may be directly mounted to the either the XY carriage or chuck itself eliminating the complexity and instability of kinematic (or other) mirror mounting techniques. Newport's proprietary optical replication process offers a cost effective approach over traditional lapping methods for applications which require performance that cannot be achieved with linear encoders.



Compared to previous stage generations, the main ceramic guide in the Datum stage has been re-designed to provide higher structural rigidity and increased load capacity. The result is a structure with a much higher natural frequency and a clean and repeatable transfer function providing exceptional servo bandwidth with identical tuning from stage-to-stage. This new ceramic guide along with the redesigned XY carriage are made from a new SiC ceramic material that is 1.5 times stiffer and 5 times more stable than the materials used in our other stage designs. The increased strength of this new ceramic is a primary factor in the new stage's improved acceleration and transfer function performance while the material stability allows for tighter repeatability and accuracy characteristics.



Ceramic Chuck with Integrated SiC Mirrors

Design Details	DynamYX Datum
Stage Architecture	Single Plane XY Air Bearing, O-Shape Configuration
Material	
Drive Mechanism	High Efficiency Brushless linear servo motors (two motors for X, one motor for Y)
Position Feedback	Laser Interferometer - Agilent Differential Interferometer, low drift
Bearings	Integrated Micro-Structure Pressure-Vaccum Air Bearings
Cable Management	
General Specifications	
Travel Range (standard, encoder or interferometer)	380 mm X-axis 350 mm Y-axis
Travel Range (maximum, encoder)	520 mm X-axis 350 mm Y-axis
Footprint (without bridge pillars, standard travel)	1040 mm x 918 mm
Rated Payload (maintains dynamic specifications)	3 kg
Maximum Load Capacity	30 kg
Maximum Velocity (rated payload)	1000 mm/sec X-axis 1000 mm/sec Y-axis
Peak Acceleration (rated payload)	3.0 G X-axis 5.0 G X-axis
RMS Acceleration (rated payload)	1.1 G X-axis 1.1 G X-axis
Granite Base Thickness (standard travel)	300 mm
Total Weight	600 kg
Stiffness, First Natural Frequency (rated payload)	300 Hz
MTBF	20,000 hrs.
Performance Specifications	
Pitch, Yaw, Roll (300 mm by 300 mm travel)	<10 µrad
XY Straightness & Flatness (300 mm circle)	0.3 µm TIR
XY Straightness & Flatness (25 mm circle)	0.05 µm TIR
XYZ Position Stability (on-air)	± 5 nm
Position Stability Is Highly Dependant On Vibration Isolation and Overall Environmental Conditions	
XYZ Position Stability (clamped)	+/- 0.5 nm
XY Orthogonality	< 5µrad
Speed Stability (velocity ripple sampled at 2kHz and 400mm/sec)	0.05%
XY Accuracy with Zerodur Scale, TIR, XY error compensation, 0.1 degree C temperature stability (300 mm circle)	0,2 µm
XY Accuracy with Agilent Interferometer, Newport SiC Replica Mirrors, XY mapping (300 mm circle)	50 nm
SiC Replica Mirror Flatness	
XY Bi-Directional Repeatability (long term, short or long displacement)	±25 nm
XY Bi-Directional Repeatability (short term, short or long displacement)	± 5 nm
Step-and-Settle Times (using Newport ND40 Passive Isolators)	
300 mm step	< 450 msec X-axis < 400 msec Y-axis
100 mm step	< 250 msec X-axis < 200 msec Y-axis
25 mm step	< 150 msec X-axis < 150 msec Y-axis
Ideal Interpolated Encoder Resolution	0.5 nm