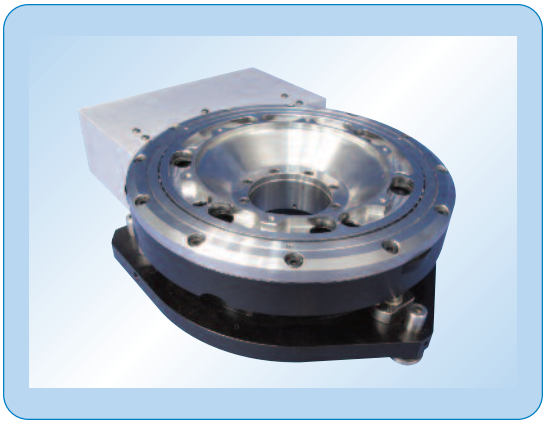
ZVR

INTEGRATED Z-THETA VERTICAL AND ROTATION STAGES FOR WAFER POSITIONING



- Precise 10 mm vertical and continuous 360 degree angular travel in a very low profile design
- Low mass and a high natural frequency accommodate rapid step-and-settle applications
- Large aperture through center of stage simplifies vacuum and electrical cable management to chuck
- All electrical and vacuum connections for stage and chuck are accessible at a single location
- Three-point bottom interface for stable mounting to any XY stage or other platform

Newport's new ZVR stages are integrated Z-vertical and Theta-rotation positioning stages designed to precisely elevate and rotate wafer chucks primarily, but other samples or objects that would require adjustments to align the object's orientation or to focus. These applications are not limited to inspection or laser machining.

The ZVR's design takes the unconventional approach of most vertical (elevation) stage designs on the market today. The payload is supported and driven at three points (separated by 120 degrees) along the outer circumference of the stage. Ordinary designs use a single cam, wedge, or screw located at the centre of the stage. Newport's three point design benefits applications that have slight to extreme unbalanced loading such as wafer probing which can impart vertical forces at locations along the outer edges of the chuck. Angular deflections due to these off-centre loads are minimized and binding during vertical motion is eliminated. The ZVR's unique design also permits convenient height and integrated tip/tilt adjustment, and allows the centre of the stage to remain open through the bottom plate, important for routing utilities to the wafer chuck. The clear aperture with the integrated rotary stage is 50 mm in diameter.

Guiding the stage through its vertical trajectory are three miniature, ultra-quiet, recirculating bearing guides. Like the drive screws that actuate vertically, these three guides are located 120 degrees apart and are in-line with the drive screws. The upper limit switch has a 4 mm adjustment range enabling the user to set the upper limit of travel. The ZVR stages are equipped with a hardware origin that serves as an absolute reference (home) position.

For optimum performance and compatibility, use Newport family of controllers for these devices. The ZVR stages are ESP compatible allowing the user to take advantage of Newport's plug and play features when used with Newport controller. Each stage axis is supplied with a 3-meter, shielded cable with 25-pin sub-D connectors for direct connection to Newport motion controller (XPS, ESP301, SMC100) or other OEM motion controller and driver.

Design Details

Base Material	Aluminum and Stainless Steel
Bearings	Stainless steel ball bearing
Drive Mechanism	Z: 3 ballscrews with 1 mm pitch Rotation: Self-compensating, preloaded, precision worm gear with 1:90 ratio
Reduction Gear	ZVR-PC: Belt reduction 16:44
Feedback (Rotary)	ZVR-PC: 8,000 cts/rev. rotary encoder
Feedback (Vertical)	None, Optional linear encoder 0.1 µm
Limit Switches	Optical ±165° (Limit switches can be disabled)
Origin	Centered on both rotation and vertical movements
Cable	3-meter, shielded cable
MTBF	20,000 hours

Theta Rotation Stage Specifications

	ZVR-PP	ZVR-PC
Travel Range	±160° or continuous 360°	
Minimum Incremental Motion (MIM)	0.0002° (1)	0.002° (1)
On Axis Accuracy, Guaranteed	0.035°	0.030°
Unidirectional Repeatabilty, Guaranteed	0.003°	0.003°
Bidirectional Repeatability, Guaranteed	0.013°	0.007°
Max. Speed	40 °/s	80 °/s
Wobble, Guaranteed	±40 µrad	
Eccentricity, Guaranteed	±4 µm	

Z Vertical Stage Specifications

Travel	10 mm
Minimum Incremental Motion (MIM)	50 nm (1)
On Axis Accuracy, Open Loop, Guaranteed	4 µm
Unidirectional Repeatabilty, Open Loop, Guaranteed	1.5 µm
Bidirectional Repeatability, Open Loop, Guaranteed	4 µm
XY Cross Talk (2), Typical	±0.1 µm
Maximum Speed	10 mm/s
Pitch, Yaw, Guaranteed	±35 µrad

1) With XPS controller.

2) XY deviation when Z direction of motion is reversed

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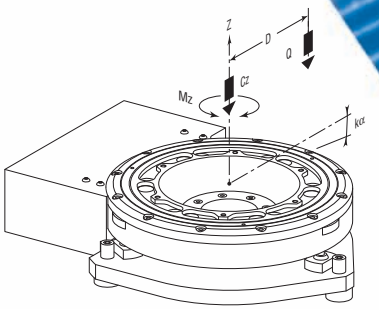
Recommended Motion Controllers/Drivers

XPS	Universal High-Performance Motion Controller/Driver Available in 2, 4, 6 or 8-axis versions
XPS-DRV01	PWM Drive Module
ESP301	Up to 3-Axis Motor Controller/Driver
SMC100	Single-Axis Motor Controller/Driver



Ordering Information

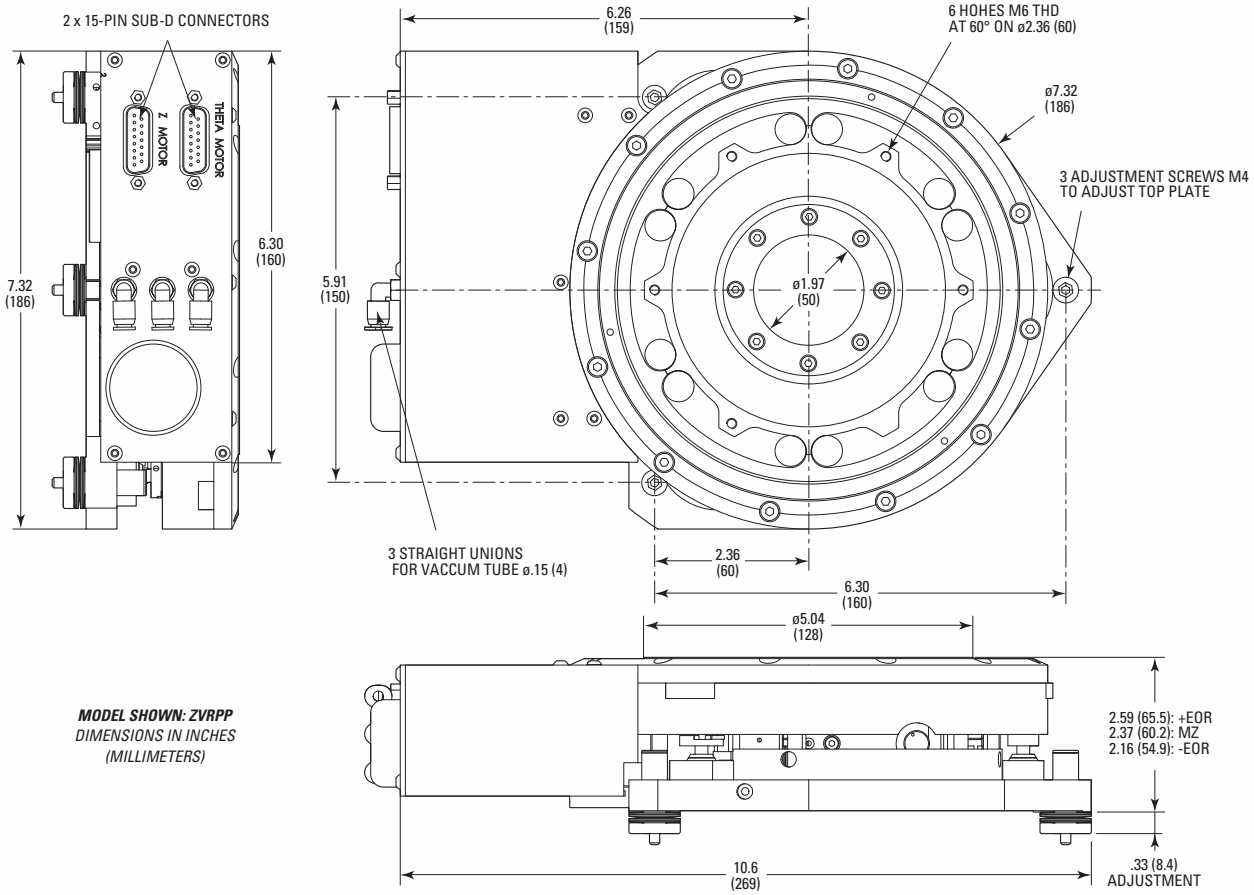
Model	Description
ZVR-PP	ZVR stage with stepper motor on Theta-axis
ZVR-PC	ZVR stage with DC-servo motor on Theta-axis

Note: Call for optional linear scale on Z-axis.

Load Characteristics

Cz, Normal load capacity	100 N
Mz, Nominal torque	1 Nm
Jz, Max. load inertia	0.050 kg.m²
Q, Off-center load	Q ≤ Cz / (1 + D/40)
D, Cantilever distance (mm)	

Dimensions



MODEL SHOWN: ZVRPP
DIMENSIONS IN INCHES
(MILLIMETERS)

Newport Experience | Solutions

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