

## VP-5ZA

## Precision Vertical Linear Stages



Picture shows prototype; final product will look slightly different

**The VP-5ZA is an ultra-low profile, precision vertical translation stage** ideally suited for semiconductor wafer inspection, photonics test and packaging, micro-assembly, precision metrology, and surface inspection systems. Based on the industry-proven technology used on our VP-25XA linear stages, the VP-5ZA offers highly reliable motion with nanometer sensitivity, high responsiveness, and a perfectly straight trajectory.

**The ultra-low profile of the VP-5ZA is achieved by an inclined-plane design** consisting of a unique arrangement of two wedges which move past each other via inclined, recirculating ball bearings. To avoid any side motion, the upper wedge is constrained by 2 pairs of vertically mounted double-row linear ball bearing slides resulting in pure vertical motion.

**A cool running, high torque DC motor with a precision preloaded, long-life ball screw** ensures high speed motion with minimum settling time. Manual movements can be accomplished using a standard screw driver. A high-resolution linear scale is directly attached to the moving rail, eliminating all drive-train induced motion errors. The space-saving, fixed reading-head design avoids any moving cables inside the stage and underlines the robustness and long lasting value of the VP-5ZA with an MTBF of 20,000 hours.

**A versatile grid of threaded holes on the top plate provides compatibility with the VP-25XA linear stages** and other Newport positioning products. A standard 3-point mounting interface for a wafer chuck is provided as well. For mounting the VP-5ZA to optical tables or our ILS linear stages, use the optional base plate VP-BP.



## Key Features

- Unique inclined plane concept delivers 4.8 mm of precision vertical motion in an ultra-low profile design
- Higher load capacity compared to vertically mounted linear stages
- Free access to the moving platform from any side
- Integrated linear encoder provides 0.02  $\mu\text{m}$  position feedback for highly repeatable and accurate motion
- Cool running, high torque DC motor with ball screw drive ensures 20,000 hours MTBF reliability

*Preliminary specifications at time of printing. For final specifications, drawings, and information, please visit "New Products" on our website, or contact Newport's Technical Support group or your Newport representative for current literature.*



## Design Details

Base Material	Aluminum
Bearings	Recirculating ball bearings, double-row linear ball bearings for vertical guidance
Drive Mechanism	Inclined plane design with transmission ratio of 5:1; Backlash-free ball screw
Drive Screw Pitch (mm)	1
Feedback	Linear steel scale, 20 $\mu\text{m}$ signal period, 0.1 $\mu\text{m}$ resolution
Limit Switches	Optical
Origin	Optical, at center of travel
Motor	DC servo motor with tachometer, UE25CC
Cable Length (m)	1.5
MTBF (h)	20,000
Weight [lb (kg)]	5.28 (2.4)

## Motion Controller Options

For optimum performance and seamless compatibility, we recommend using one of the following Motion Controllers/Drivers:

ESP7000



MM4006



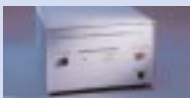
ESP6000 with UNIDRIV6000



ESP300



ESP100



## Specifications

Travel Range (mm)	4.8
Resolution ( $\mu\text{m}$ )	0.02 <sup>(1)</sup>
Uni-directional Repeatability ( $\mu\text{m}$ )	0.3
Reversal Value (Hysteresis) ( $\mu\text{m}$ )	0.2
On Axis Accuracy ( $\mu\text{m}$ )	3
Maximum Speed (mm/s)	5
Pitch ( $\mu\text{rad}$ )	100
Roll ( $\mu\text{rad}$ )	100
Yaw ( $\mu\text{rad}$ ) <sup>(2)</sup>	100

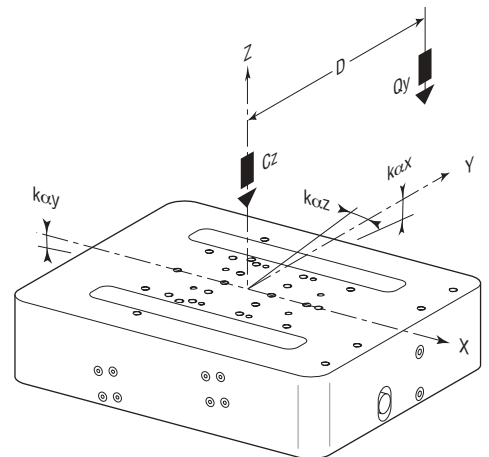
1) Nominal; actual resolution specified with each individual stage

2) Rotation around vertical axis

## Load Characteristics and Stiffness

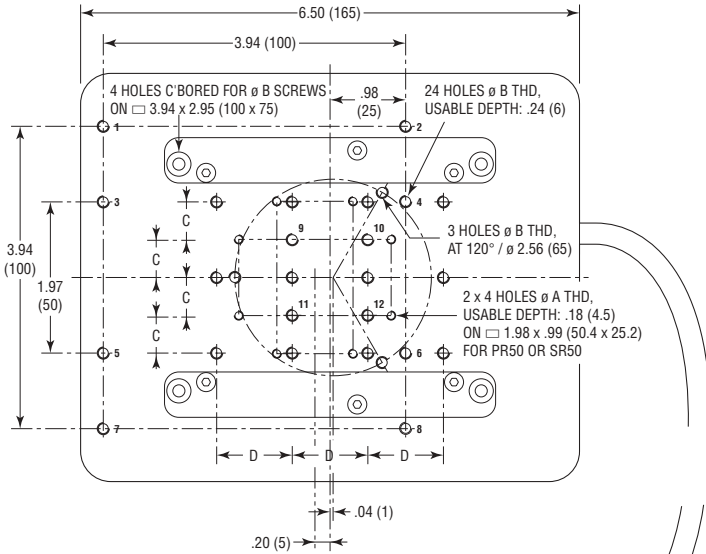
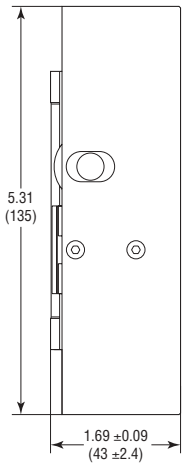
$C_z$	0 to 50 N
$k_{\alpha x}$	50 $\mu\text{rad}/\text{N.m}$
$k_{\alpha y}$	45 $\mu\text{rad}/\text{N.m}$
$k_{\alpha z}$	10 $\mu\text{rad}/\text{N.m}$

$Q$	Off-center load, $Q_x, Q_y \leq C_z/(1 + D/30)$
$D$	Cantilever distance in mm
$C_z$	Normal center load capacity on bearings
$k_{\alpha x}$	Angular stiffness (Roll)
$k_{\alpha y}$	Angular stiffness (Pitch)
$k_{\alpha z}$	Angular stiffness (Yaw)

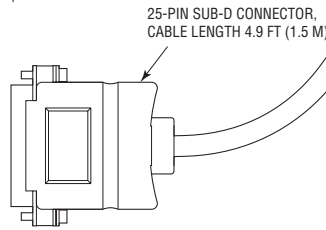


## Dimensions

### (M-)VP-5ZA

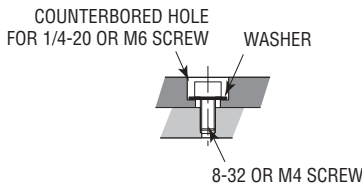


STAGE MOUNTED	HOLES USED
RGV100	1-2-7-8
(M-)495CC	3-4-5-6
(M-)VP-25XA	1-2-5-6 OR 3-4-7-8
(M-)PM500-1L	9-10-11-12

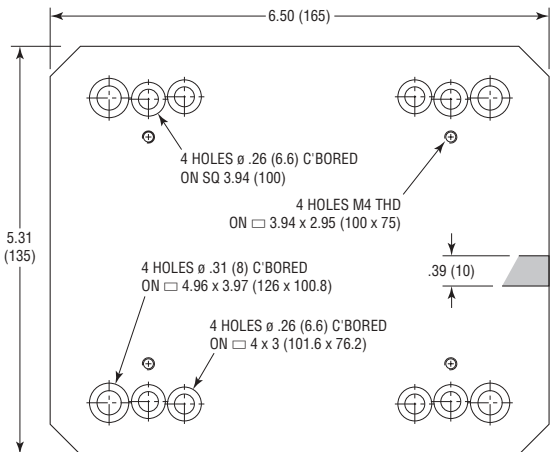


MODEL	A	B	C	D
ENGLISH				
INCHES				
VP-5ZA	4-40	8-32	0.5	1.0
METRIC				
MILLIMETERS				
M-VP-5ZA	M3	M4	12.7	25.4

Components with counterbored holes for 1/4-20 (M6) screws can be attached to the top plate of the VP-5ZA (M-VP-5ZA) using 8-32 (M4) screws and the washers supplied with each stage.



### VP-BP



Ultra low-profile precision XYZ system consisting of two VP-25XA linear stages and one VP-5ZA vertical translation stage. Compared to traditional stacks of stages, this solution offers a lower-profile alternative with easy access to the load from any side.



A VP-5ZA stage mounted on top of an ILS linear stage (with optional VP-BP base plate). The vertical lift approach of the VP-5ZA allows centering of the payload over the bearings and close to the position feedback system. This avoids any cantilevered loads and results in more precise motion with higher load capacity.



## Ordering Information

Description	Model	Metric Model
VP-5ZA Stage	VP-5ZA	M-VP-5ZA
Universal Base Plate	VP-BP	VP-BP



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