

VP-25X Precision Compact Linear Stages



- Precise 1 in. (25 mm) travel in a very small envelope
- Adjustments with down to 10 nm of motion sensitivity
- Integrated linear encoder for backlash free, highly repeatable, and accurate motion
- Innovative, fixed reading-head design avoids any moving cables
- Low friction ballscrew drive provides 20,000 hours MTBF

The VP-25X stages address multi-axis, high precision positioning requirements in fiber optics, bio-medical, semiconductor, and high precision test and measurement applications. Features including its ultra-compact size and high reliability make them appropriate for device testing, micro-assembly, micro-machining, and manipulation of small, lightweight parts such as fiber optical devices, micro-optics, MEMS, cell probes, or semiconductor devices.

Based on a high precision drive technology including low-friction ball screw and re-circulating ball bearings, the VP-25X stages deliver highly reliable positioning performance at a maximum speed of 25 mm/s. Compared to alternative direct-drive technologies, the ball screw drive of the VP-25X stages provides greater thrust for higher servo stiffness and load capacity, higher efficiency resulting in less heat induced position drift, as well as minimum tuning efforts. Furthermore, the self-locking at power-off considerably simplifies operational safety.

The modular VP-25XA stages enable the construction of compact multi-axes positioning systems. For example, by combining three VP-25XA stages with the VP-BK bracket, a versatile and compact 3 degrees of motion system is produced, keeping the height of the horizontal mounting plate as low as 4 in. (± 0.5 in.). For applications requiring up to 6 degrees of motion, our SR50 and PR50 rotation stages and GON series goniometers see page 908 can be easily added to the system. This complete modular approach provides the greatest advantage regarding flexibility, customization, performance, and ease-of-use.

The VP-25X stages are available in two variants: The VP-25XA provides a RS422 standard encoder output with 0.1 μm resolution, that is compatible with our popular ESP300 and other motion controllers. The VP-25XL provides a 1 Vpp analog encoder interface. When used with our XPS motion controller, these stages deliver a reliable 10 nm motion sensitivity, and better than 140 nm bi-directional repeatability.

Design Details

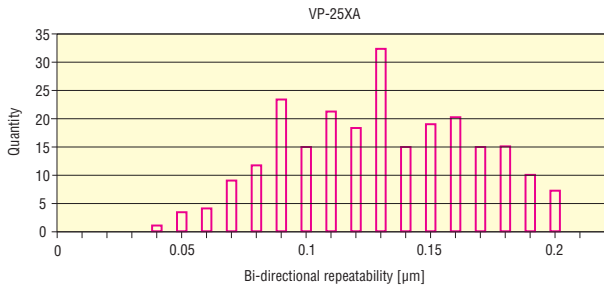
Base Material	Aluminum
Bearings	Recirculating ball bearings
Drive Mechanism	Backlash-free ball screw
Drive Screw Pitch (mm)	1
Feedback	Linear steel scale, 20 μm signal period. VP-25XA: RS422 output with 0.1 μm resolution. VP-25XL: 1 Vpp analog sin-cos output
Limit Switches	Optical
Origin	Optical, at center of travel
Motor	DC servo motor with Tachometer UE25CC
Cable Length (m)	1.5
MTBF (h)	20,000
Weight [lb (kg)]	3.3 (1.5)

Specifications

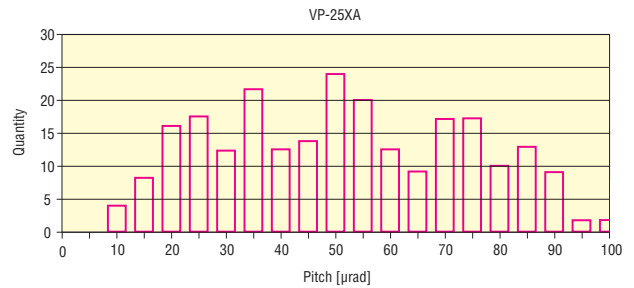
	VP-25XA (M-VP-25XA)	VP-25XL (M-VP-25XL)
Travel Range (mm)	25	
Resolution (μm)	0.1	0.0006 ⁽¹⁾
Sensitivity (μm)	0.1	0.01 ⁽¹⁾
Bi-directional Repeatability (μm)	0.15 typical, 0.2 guaranteed	0.14 guaranteed ⁽¹⁾
On Axis Accuracy (μm)	1.0 typical, 2.0 guaranteed	
Maximum Speed (mm/s)	25	
Pitch, Yaw (μrad)	50 typical, 100 guaranteed	

See the Metrology Tutorial section (see page 845) for more information on typical and guaranteed specifications

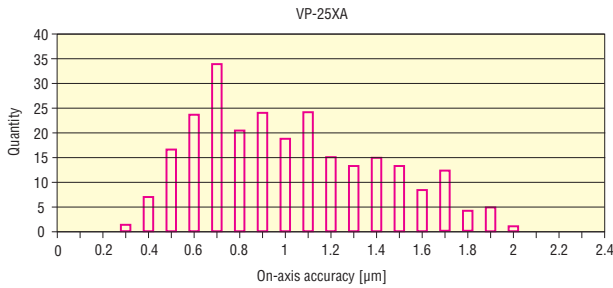
When used with XPS controllers



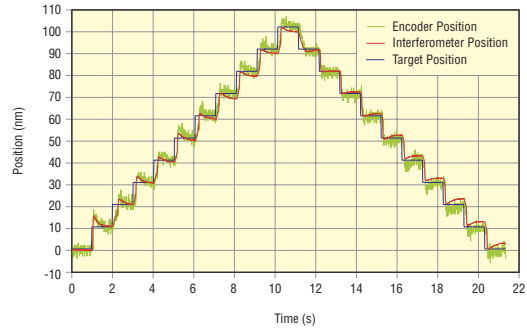
Bi-directional repeatability plot for VP-25XA Series stages. The typical (mean) bi-directional repeatability is 0.15 µm. The guaranteed value is 0.2 µm.



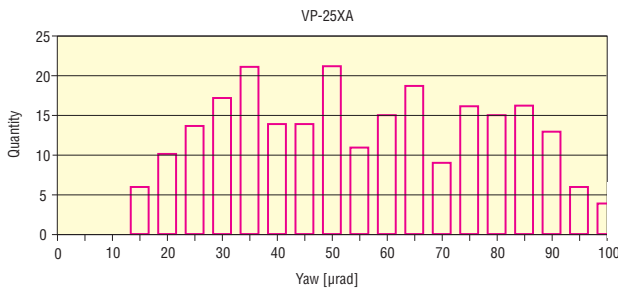
Pitch plot for VP-25X Series stages. The typical (mean) pitch is 50 µrad. The guaranteed value is 100 µrad.



On-axis accuracy plot for VP-25XA Series stages. The typical (mean) on-axis accuracy is 1.0 µm. The guaranteed value is 2.0 µm.



VP-XL Stages deliver 10 nm motion sensitivity with high reliability and position stability.



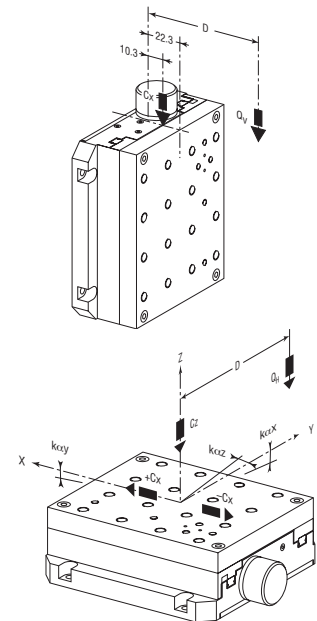
Yaw plot for VP-25X Series stages. The typical (mean) pitch is 50 µrad. The guaranteed value is 100 µrad.

Load Characteristics and Stiffness

Cz	60 N
-Cx; +Cx	40 N
k _{αx}	20 µrad/N.m
k _{αy}	20 µrad/N.m
k _{αz}	30 µrad/N.m

Normal Load Characteristics

Q _H	Off-center load, $Q_H \leq Cz / (1 + D/30)$
D	Cantilever distance in mm
Cz	Normal center load capacity on bearings
+Cx	Direct load capacity on X axis
-Cx	Inverse load capacity on X axis
k _{αx}	Angular stiffness (Roll)
k _{αy}	Angular stiffness (Pitch)
k _{αz}	Angular stiffness (Yaw)



Axial Load Characteristics

Q_v	Off-center load, $Q_v \leq Cz / (1 + D/30)$
D	Cantilever distance in mm between the center of mass of the load and the bearings center.
22.3	Distance between top surface and the bearings center in mm.
10.3	Distance between under the top plate and the bearings center in mm.

Motion Controller Options

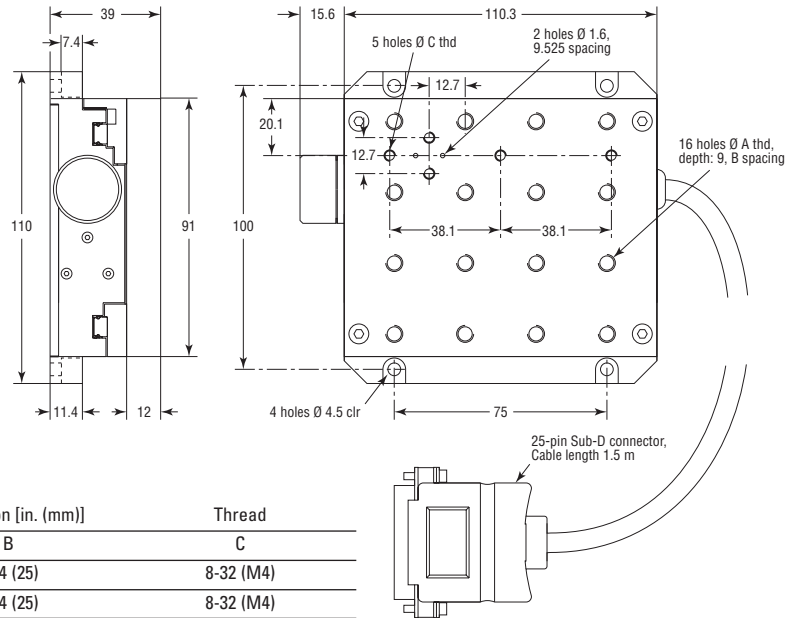
For optimum performance and seamless compatibility, we recommend using one of the following Motion Controllers/Drivers:

Model	
XPS (page 1009)	VP-25XA and VP-25XL versions
ESP300 (page 1018)	VP-25XA
SMC100CC (page 1020)	VP-25XA

Dimensions

Dimensions in millimeters. VP-25XA shown

Model (Metric)	Thread	Dimension [in. (mm)]	Thread
	A	B	C
VP-25XA (M-VP-25XA)	1/4-20 (M6)	25.4 (25)	8-32 (M4)
VP-25XL (M-VP-25XL)	1/4-20 (M6)	25.4 (25)	8-32 (M4)

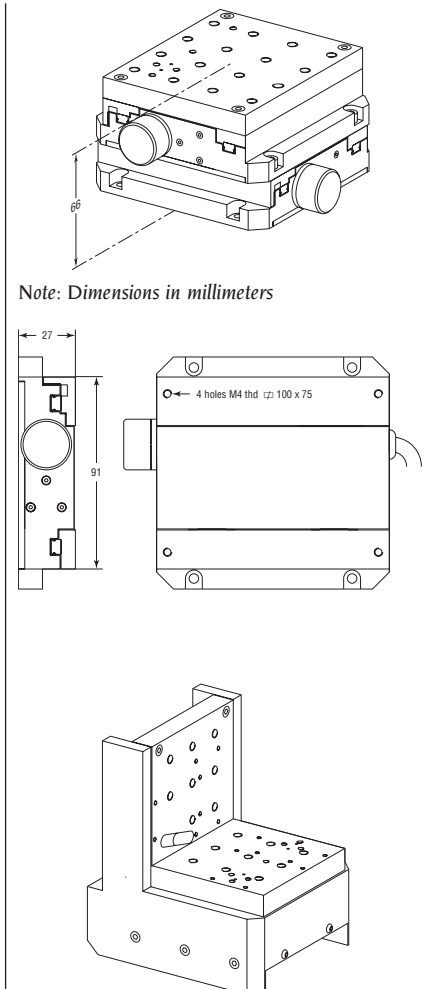


Ordering Information

Description	Model (Metric)
VP-25XA Stage	VP-25XA (M-VP-25XA)
VP-25XL Stage	VP-25XL (M-VP-25XL)
Bracket	VP-BK (M-VP-BK)
Left-handed XYZ stack of 3 (M-)VP-25XA and 1 (M-)VP-BK; $\pm 50 \mu\text{rad}$ XY orthogonality; $\pm 100 \mu\text{rad}$ XZ and YZ orthogonality	VP-25XA-XYZL (M-VP-25XA-XYZL)
Right-handed XYZ stack of 3 (M-)VP-25XA and 1 (M-)VP-BK; $\pm 50 \mu\text{rad}$ XY orthogonality; $\pm 100 \mu\text{rad}$ XZ and YZ orthogonality	VP-25XA-XYZR (M-VP-25XA-XYZR)
Left-handed XYZ stack of 3 (M-)VP-25XL and 1 (M-)VP-BK; $\pm 50 \mu\text{rad}$ XY orthogonality; $\pm 100 \mu\text{rad}$ XZ and YZ orthogonality	VP-25XL-XYZL (M-VP-25XL-XYZL)
Left-handed XYZ stack of 3 (M-)VP-25XL and 1 (M-)VP-BK; $\pm 50 \mu\text{rad}$ XY orthogonality; $\pm 100 \mu\text{rad}$ XZ and YZ orthogonality	VP-25XL-XYZR (M-VP-25XL-XYZR)
Universal Base Plate	VP-BP
Set of 4 base clamps. Allows attachment of VP-25XA to optical tables with 1/4-20 holes on 1 in. grid (M6-1.0 holes on 25 mm grid)	VP-BC
Dovetail rail for ULTRAlign™ positioning system:	
Length: 3.7 in. (94 mm)	562-RAIL-3.7
Length: 1 in. (25.4 mm)	561-RAIL-1

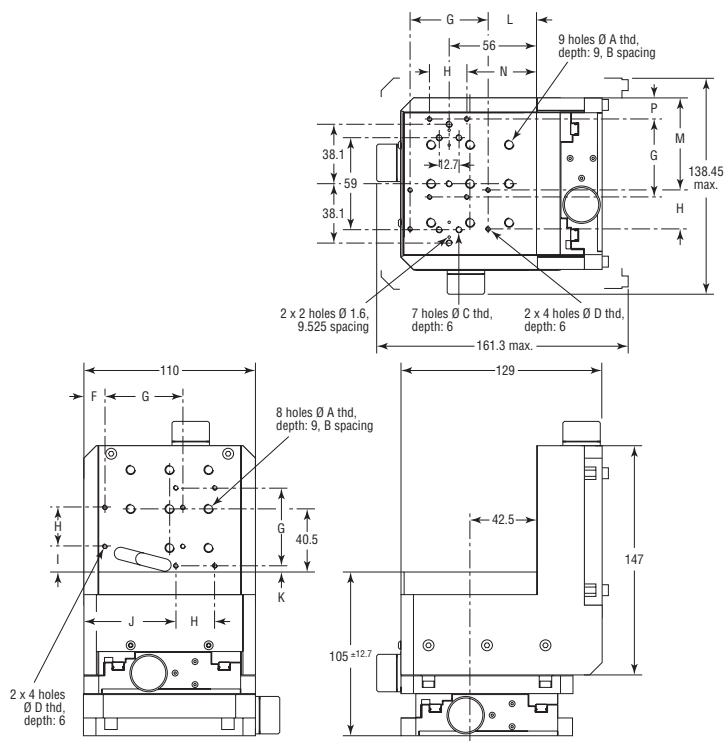
Assembly Pattern

To make an XY assembly it is necessary to remove the top plate of the lower stage. To do so, just unscrew the 4 CHc M4 x 12/100 x 75 screws of the top plate using the wrench supplied with the stage. The VP-25X stage will then have the following interface:



Note: Dimensions in millimeters

XYZ Assembly



Dimension (mm)

Model (Metric)	A	B	C	D	
VP-BK (M-VP-BK)	1/4-20 (M6)	25.4 (25)	8-32 (M4)	4-40 (M3)	
	F	G	H	I	J
VP-BK (M-VP-BK)	13.1 (13.5)	50.8 (50)	25.4 (25)	16.3 (16.5)	58.8 (59)
	K	L	M	N	P
VP-BK (M-VP-BK)	3.6 (4)	30.6 (31)	58.95 (59.15)	43.3 (43.5)	13.25 (13.65)



VP-25X stages can easily be assembled into an XYZ configuration with optional VP-BK bracket. Shown here is a left-handed stack, (M-)VP-25X-XYZL.

TECHNICAL REFERENCE

MANUAL LINEAR STAGES

MANUAL ROTATION STAGES

MANUAL ACTUATORS

MOTORIZED LINEAR STAGES

MOTORIZED ROTATION STAGES

MOTORIZED ACTUATORS

CONTROLLERS AND AMPLIFIERS

SYSTEMS