XMS100V Ultra High Precision Direct Drive Motorized Vertical Linear Stage

The ultra-high precision performance of XM series stages is now available in a vertical orientation, made possible with a pneumatic counterbalance.

The challenge for vertical motion has always been the combination of high precision and long travel. Prior to the XMS-V, to obtain high precision, the travel is limited to 30mm (GTS30V) and for longer travel, the positioning accuracy is compromised (IMS-V). Now with the XMS100V, both ultra-high precision and long travel are available. Typical applications include focusing, sensor test and calibration, direct laser lithography, fiber alignment, ultra precision assembly and more.

The XMS100V stage is comprised of a standard XMS100 stage mounted on a high flatness (surface flatness within 5 µm) vertical plate and a low friction air cylinder connected to the carriage (Figure 1). The custom-designed connection of the air cylinder to the carriage eliminates the effect of the air cylinder's motion on the performance of the XMS100 stage. With the proper adjustment of pressure, a perfect balance of the load can be achieved. When motor power is turned off, the air cylinder's valve will enable a controlled descent of the carriage.

Fig 1: Images of a XMS100V Stage

High-precision vertical motion is achieved using a frictionless direct drive with ironless linear motor. Compared to alternative vertical stage designs that use gearbox or ball screw mechanisms, the direct drive technology allows highly dynamic motion with essentially no backlash, hysteresis, wind-up or stiction, leading to consistently lower and more repeatable run-out errors. In addition, the lack of screw driving elements leads to outstanding ripple-free motion required in high sensitivity focusing adjustment. The advantage of high speed, acceleration from the linear motor is retained in a vertical orientation, for increased efficiency. The direct drive motor with the air cylinder support provides extreme position stability against any external force in a vertical direction. Even when the motor power is turned off, the air cylinder prevents the carriage from falling with the gravitational force, a problem with direct drive stages in a vertical arrangement.

	XMS100	XMS100-V
Travel Range (mm)	100 mm	100 mm
Minimum Incremental Motion (µm)	0.01	0.05*
Bi-directional repeatability (µm)	0.08	0.1*
On-axis accuracy (µm)	1.5	1.5
Maximum speed (mm/s)	300	300
Maximum acceleration (m/s²)	5	5
Load capacity (Cz) (N)	100	100
Pitch (µrad)	50	75*
Yaw (µrad)	50	50*

*Table 1: XMS100V Specification (*Typical values shown)*

Precision position feedback is supplied by a high accuracy linear scale encoder. Newport XPS motion controller interpolates the encoder signals and minimizes the noise to provide outstanding position sensitivity and repeatability in the nm-range. Absolute home position and limit signals are incorporated on the same linear scale for improved reliability and accuracy.

When combined with XM series or GTS series ultra-precision linear stages in XYZ (Figure 2), the most accurate, repeatable trajectory control can be achieved with an XPS series universal controller. Other multiple-axis configurations are possible, using URS series and RGV100 series rotation stages or VP-25X precision linear stages. The vertical mounting plate can be customized to allow easy integration with other linear and rotation stages.

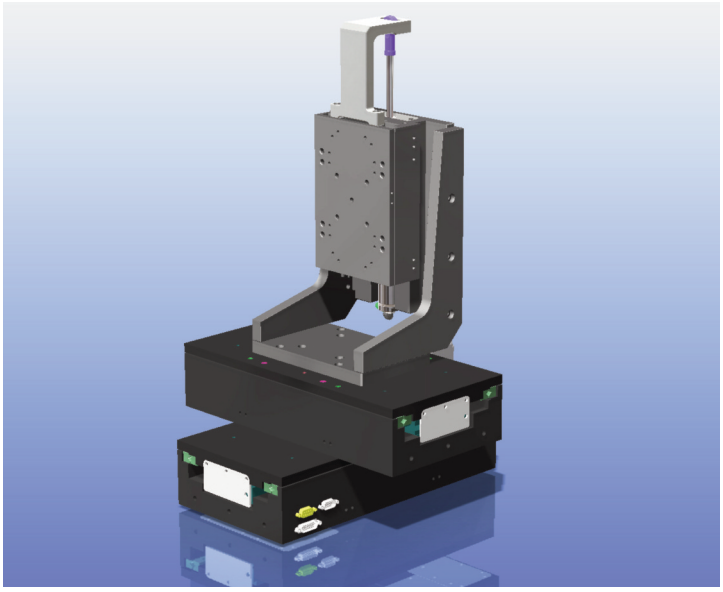

Fig 2: An XYZ System with XML210's in XY and a XMS100V in Z

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Shown in table 1 is the performance comparison of the XMS100V with a standard XMS100 stage. The XMS100V stage has the same outstanding accuracy and speed stability as an XMS100 stage in a horizontal orientation. The XMS100V also provides excellent minimum incremental motion and bi-directional repeatability that are superior to other high precision vertical linear stages. Figure 3 shows the on-axis accuracy of an XMS100V stage, taken at a rate of 10 kHz while the stage was moving at a speed of 100 mm/s. Figure 4 illustrates the exceptional speed stability of the XMS100V stage in continuous scanning.

To order the XMS100V stage or for additional information, please contact Newport sales and application engineers at tech@newport.com.

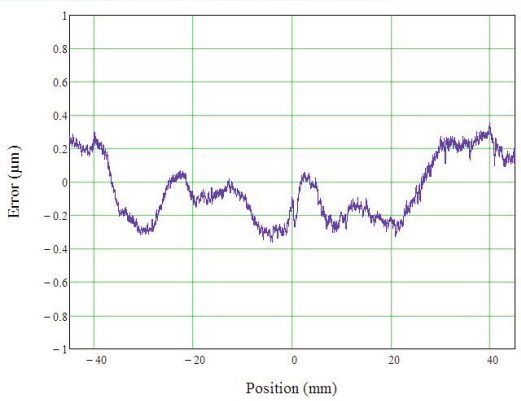

Fig 3: On-axis accuracy of the XMS100V

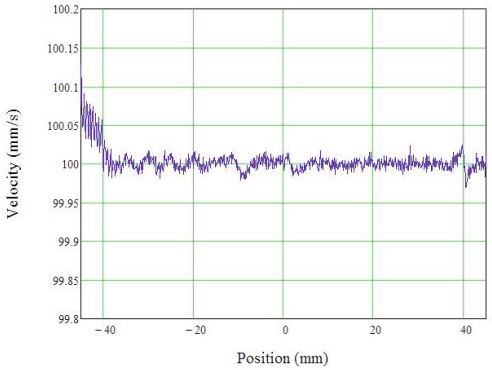

Fig 4: Speed stability of the XMS100V

For more information please contact Newport Corporation Application Engineers at 800.222.6440.

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