

Direct Drive Z-Stage with Magnetic Counterbalance

Ideal for Focusing, Scanning, Measuring, Imaging, Optical Alignment

Preliminary
Datasheet



V-571.Z

- Available travels of 25mm and 50mm
- User-adjustable magnetic counterbalance
- Direct drive motor for efficient, dynamic performance
- Crossed-roller bearings for optimum straightness, flatness and low noise
- Incremental or Absolute Encoder for the best accuracy, repeatability, and safety (Absolute)

Product overview

V-571.Z vertical translation stages are designed for accuracy, precision, long life, ease of use. Due to the user-adjustable magnetic counterbalance they can be operated in vertical orientation ensuring minimal current on the linear motor and enhanced dynamic performance.

Even though compact, V-571 nanopositioning stages offer superior travel accuracy, flatness, and performance compared to many bigger motorized positioning stages. With a powerful, non-cogging, direct drive motor, the V-571 family of vertical translation stages performs well in production environments.

The absolute encoder version provides not only 1nm resolution, but also the safest and most efficient start, not requiring initialization or homing. The ultra-precision cross roller bearings are intended to be low maintenance for the life of the stage.

The V-571 family of positioning stages also includes linear stages for horizontal mounting with travel ranges to 100mm. These stages can be combined for XY and XYZ positioning applications.

Ordering Information

V-571.025A1MZ

Linear Motor Cross-Roller Bearing Z-Stage, 95mm Wide, 25mm Travel, SIN/COS 20µm Encoder, Magnetic Z Counterbalance

V-571.025B1MZ

Linear Motor Cross-Roller Bearing Stage, 95mm Wide, 25mm Travel, Absolute 1nm Encoder, Magnetic Z Counterbalance

V-571.050A1MZ

Linear Motor Cross-Roller Bearing Stage, 95mm Wide, 50mm Travel, SIN/COS 20µm Encoder, Magnetic Z Counterbalance

V-571.050B1MZ

Linear Motor Cross-Roller Bearing Stage, 95mm Wide, 50mm Travel, Absolute 1nm Encoder, Magnetic Z Counterbalance

See additional matching [V-571 linear stages for horizontal mounting](#)

Three phase motors for higher dynamics and friction-free, maintenance-free operation

The three-phase linear motors driving the V-571 stage family transfer their force directly and friction-free to the motion platform. This eliminates backlash and play that can result from mechanical components like gears and screws in the drivetrain. Ideal for high-velocity, high-acceleration applications, these motors feature a maintenance-free, frictionless design, ensuring longevity in demanding 24/7 operations. The controller's current limit settings allow easy motor disablement, preventing damage to the stage or the application.

Crossed roller bearings improve load capacity, accuracy and lifetime

Crossed roller bearings offer a superior level of smoothness, straightness, and flatness, close to air bearing performance. By replacing the point contact of ball bearings with a line contact, rollers become considerably stiffer, requiring less preload. This reduction in friction enables smoother running and higher accuracy. Crossed roller bearings can also support more direct loads and moment loads. The anti-creep mechanism prevents roller drift, enhancing reliability. Cleanroom grease is applied for low-maintenance operation.

Incremental and absolute encoder options

V-571 stages are equipped with linear encoders that measure position with utmost accuracy directly at the motion platform, enhancing linearity and ensuring immunity to mechanical play and elastic deformation of indirect measuring methods. Incremental encoders, relying on 1Vpp sine/cosine signals, require a home signal to initiate. In contrast, absolute measuring linear encoders offer explicit position information, enabling immediate determination of the position. This eliminates the need for referencing during switch-on, enhancing both efficiency and safety during operation.

Choosing the right precision positioning stage and motion controller

Selecting the right positioning stage is pivotal for optimal performance in high-precision motion applications, such as semiconductor inspection and photonics alignment. Factors such as resolution, guiding accuracy, and repeatability must be carefully considered. The V-571 stage family provides exceptional geometric accuracy (flatness, straightness, pitch, and yaw) and bi-directional repeatability in a very compact package. With high dynamic properties, featuring 1 g acceleration and 500 mm/sec velocity, these fast and accurate vertical translation stages are ideal for automation of highly accurate positioning tasks required for the mass production of precision devices.

Partnered with PI's A-8xx series motion controllers, these stages achieve unparalleled motion performance. PI's EtherCAT®-based controllers offer remarkable flexibility, facilitating the seamless integration of third-party equipment compatible with EtherCAT®. Advanced algorithms in the A-8xx series motion controllers, such as PILOT allow for higher dynamics with reduced motor currents, virtually increasing the motor's force constant. Choose V-571 for precision, reliability, and efficiency in your motion applications.

Accessories and options

- Encoder type – 1Vpp Sin/Cos or Absolute BiSS output
- Counterbalance for vertical use
- Single or multi-axis, ACS motion controllers and servo drives, integrated or distributed
- Cables compatible with the A-8xx series, ACS-powered controllers.
- Multi-axis XY- and XYZ-stage assemblies
- Granite support base

Application fields

Sample inspection. Precision micro-assembly. Research. Biotechnology. Semiconductor test and inspection. Metrology. General Automation. Device assembly. Laser Micro-processing. Pick and place. Alignment of optics, micromechanics and photonics components.

Specifications

Motion	V-571.025x1MZ	V-571.050x1MZ	Unit	Tolerance
Active axes	Z-Axis			
Travel range	25	50	mm	max.
Pitch ⁽¹⁾	80	100	μrad	max.
Yaw ⁽¹⁾	25	50	μrad	max.
Straightness ⁽¹⁾	0.5	0.5	μm	max.
Flatness ⁽¹⁾	0.5	0.6	μm	max.
Bidirectional repeatability	± 0.06	± 0.06	μm	max.
Positioning accuracy, calibrated ⁽²⁾	± 0.12	± 0.12	μm	max.

Mechanical	V-571.025x1MZ	V-571.050x1MZ	Unit	Tolerance
Bearing	Ultra-precision, cross-roller bearing			
Motion platform	95 x 95	140 x 95	mm	
Stage Height	33		mm	
Load capacity, ⁽³⁾	4		kg	max.
Moving mass, unloaded	0.4	0.5	kg	typ.
Overall mass	0.9	1.3	kg	typ.
Materials	Hardcoat aluminum body			

Drive Properties	V-571.025x1MZ	V-571.050x1MZ	Unit	Tolerance
Drive type	3 Phase brushless linear motor			
Intermediate circuit voltage	60	60	V DC	max.
Peak force	21	21	N	max.
Nominal force	7.1	7.1	N	max.
Force constant, RMS	3.5	3.5	N/Arms	typ.
Peak Current	6.5	6.5	A	max.
Nominal Current, RMS	2.2	2.2	A	max.
Resistance, phase-phase	4.26	4.26	Ω	±10%
Inductance, phase-phase	0.53	0.53	mH	±10%
Back EMF, phase-phase	3.85	3.85	V/m/s	±10%
# of Pole Pairs				
Magnet Pitch NN	19.05	19.05	mm	typ.
Linear Velocity ⁽³⁾	500	500	mm/s	max.
Acceleration ⁽³⁾	10	10	m/s ²	max.

NOTES

⁽¹⁾ Dependent on the quality of the mounting surface, the payload, orientation, and external forces that act on the stage. Please contact PI for application-specific parameters. The specified values are static (no motion during measuring) and without load.

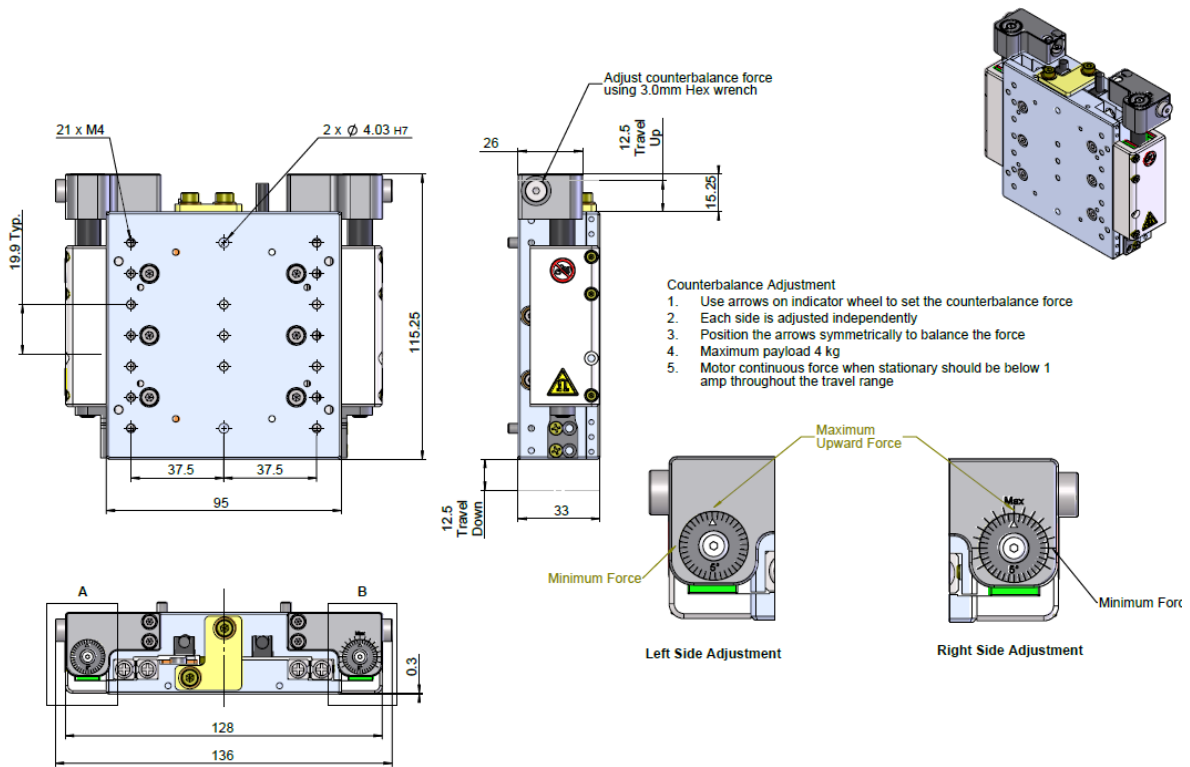
⁽²⁾ The specified values are based on error compensation enabled by the PI controller. The positioner must be ordered with a controller from PI to reach these values. Accuracy values assume short-term duration and do not consider the long-term effects of thermal drift on the stage.

⁽³⁾ Can be limited by imbalance of the payload or the controller and the drive.

Measurement Sensor	V-571.xxxA1	V-571.xxxB1
Integrated sensor	Incremental encoder	Absolute encoder
Sensor signal type	Sin/cos, 1 V pp	BiSS-C, 32 bit
Sensor resolution	1 nm	1 nm
Reference point switch	1 at middle of travel, 1 V pp	N/A

Miscellaneous	V-571.xxxx1
Motor Connector	3W3 (male)
Encoder Connector	DB15 (male)
Operating Temp Range	5 to 50 °C
Recommended Controller	A-81x, A-82x Series
Recommended Cables	A-851.Vx03

Drawings / Images



V-571.Z dimensions in mm, 25mm version top, 50mm version below

