

# Direct Drive Z-Stage with Magnetic Counterbalance

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

Preliminary  
Datasheet

## V-572.Z

- 60mm travel
- 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-572.Z vertical translation stages are high-precision Z-stages designed for accuracy, long service life, and reliable operation in demanding automation and positioning applications. Thanks to a user-adjustable magnetic counterbalance, these vertical lift stages are optimized for vertical orientation, minimizing motor current while improving dynamic performance and efficiency.

Despite their compact footprint, V-572 nanopositioning Z-stages deliver exceptional travel accuracy, straightness, and flatness, outperforming many larger motorized lift stages. A powerful, non-cogging direct-drive linear motor ensures smooth motion and high repeatability, making the V-572 family well suited for continuous operation in production environments.

The absolute encoder option provides 1 nm resolution and enables safe, efficient startup without homing or initialization. Ultra-precision cross-roller bearings ensure high stiffness and low maintenance over the lifetime of the vertical translation stage.

The V-572 family of positioning stages also includes linear stages for horizontal mounting with travel ranges of up to 100 mm. These stages can be combined to form XY and XYZ positioning systems for precision motion applications. All V-572 stages are compatible with PI's standard A-8xx control electronics.

### Ordering Information

#### V-572.060A1MZ

Linear Motor Cross-Roller Bearing Stage, 130mm Wide, 60mm Travel, SIN/COS 20µm Encoder, Magnetic Z Counterbalance

#### V-572.060B1MZ

Linear Motor Cross-Roller Bearing Stage, 130mm Wide, 60mm Travel, Absolute 1nm Encoder, Magnetic Z Counterbalance

See additional matching [V-572 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-572 stage family transfer force directly and friction-free to the motion platform, eliminating backlash and mechanical play associated with gears, screws, or other drivetrain components. Optimized for high-velocity and high-acceleration motion, these motors feature a maintenance-free, contactless design that ensures long-term reliability in demanding 24/7 operating environments. Adjustable current limits in the controller allow the motor to be safely disabled under overload conditions, helping protect both the stage and 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, lower noise 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-572 stages are equipped with high-resolution linear encoders that measure position directly at the motion platform, ensuring excellent linearity and immunity to mechanical play or elastic deformation associated with indirect measurement methods. Incremental encoders based on 1 Vpp sine/cosine signals require a reference move to a home position after power-up. In contrast, absolute linear encoders provide unambiguous position information at all times, allowing the stage position to be determined immediately after switch-on. This eliminates the need for homing, improving operational efficiency while enhancing safety and reliability.

### **Choosing the right precision linear stage and motion controller**

Selecting the right positioning stage is critical to achieving optimal performance in high-precision motion applications such as semiconductor inspection and photonics alignment. Key parameters—including resolution, guiding accuracy, and repeatability—must be carefully evaluated. The V-571 stage family delivers exceptional geometric accuracy, including flatness, straightness, pitch, and yaw, along with excellent bidirectional repeatability, all in a highly compact design. Featuring high dynamic performance with accelerations of up to 1 g and velocities of up to 500 mm/s, these fast and accurate vertical translation stages are ideally suited for automated, high-precision positioning tasks in the mass production of advanced devices.

Configured with PI's A-8xx series motion controllers, these stages deliver exceptional motion performance. The EtherCAT®-based controller architecture provides high flexibility and enables seamless integration of third-party equipment compatible with EtherCAT®. Advanced control algorithms implemented in the A-8xx series, such as PILOT, enable higher dynamic performance while reducing motor current, effectively increasing the motor's usable force constant. Choose the V-572 for precision, reliability, and efficiency in demanding motion-control applications.

### **Accessories and options**

- Encoder options – 1Vpp Sin/Cos or Absolute BiSS output
- 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 & Positioning	V-572.060x1MZ	Unit	Tolerance
Active axes	Z-axis		
Travel range	60	mm	max
Pitch (Angular error around Y) <sup>(1)</sup>	± 50	μrad	max.
Yaw (Angular error around Z) <sup>(1)</sup>	± 60	μrad	max.
Straightness (Error in Y) <sup>(1)</sup>	± 0.8	μm	max.
Flatness (Error in Z) <sup>(1)</sup>	± 0.8	μm	max.
Bidirectional repeatability	± 0.08	μm	max.
Positioning accuracy, calibrated <sup>(2)</sup>	± 0.20	μm	max.
Drive Type	Ironless 3-phase linear motor		

Mechanical	V-572.060X1MZ	Unit	Tolerance
Bearing	Ultra-precision, cross-roller bearing		
Motion platform	180 x 130	mm	
Stage Height	75	mm	
Load capacity, <sup>(3)</sup>	7	kg	max.
Moving mass, unloaded	1.4	kg	typ.
Overall mass	3.4	kg	typ.
Bearing Type	Crossed Roller Bearings		
Materials	Aluminum base body, black anodize		

Drive properties	V-572.060X1Mz	Unit	Tolerance
Drive Type	3 Phase brushless linear motor		
Intermediate circuit voltage	48	V DC	max.
Peak force	60	N	max.
Nominal force	20	N	max.
Force constant, RMS	10	N/Arms	typ.
Peak Current	6	A	max.
Nominal Current, RMS	2.2	A	max.
Resistance, phase-phase	11	Ω	±10%
Inductance, phase-phase	1.6	mH	±10%
Back EMF, phase-phase	10	V/m/s	±10%
# of Pole Pairs			
Magnet Pitch NN	38.1	mm	typ.
Maximum Linear Velocity unloaded <sup>(3)</sup>	500	mm/s	max.
Acceleration in X, unloaded <sup>(3)</sup>	10	m/s <sup>2</sup>	max.

### NOTES

<sup>(1)</sup> 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.

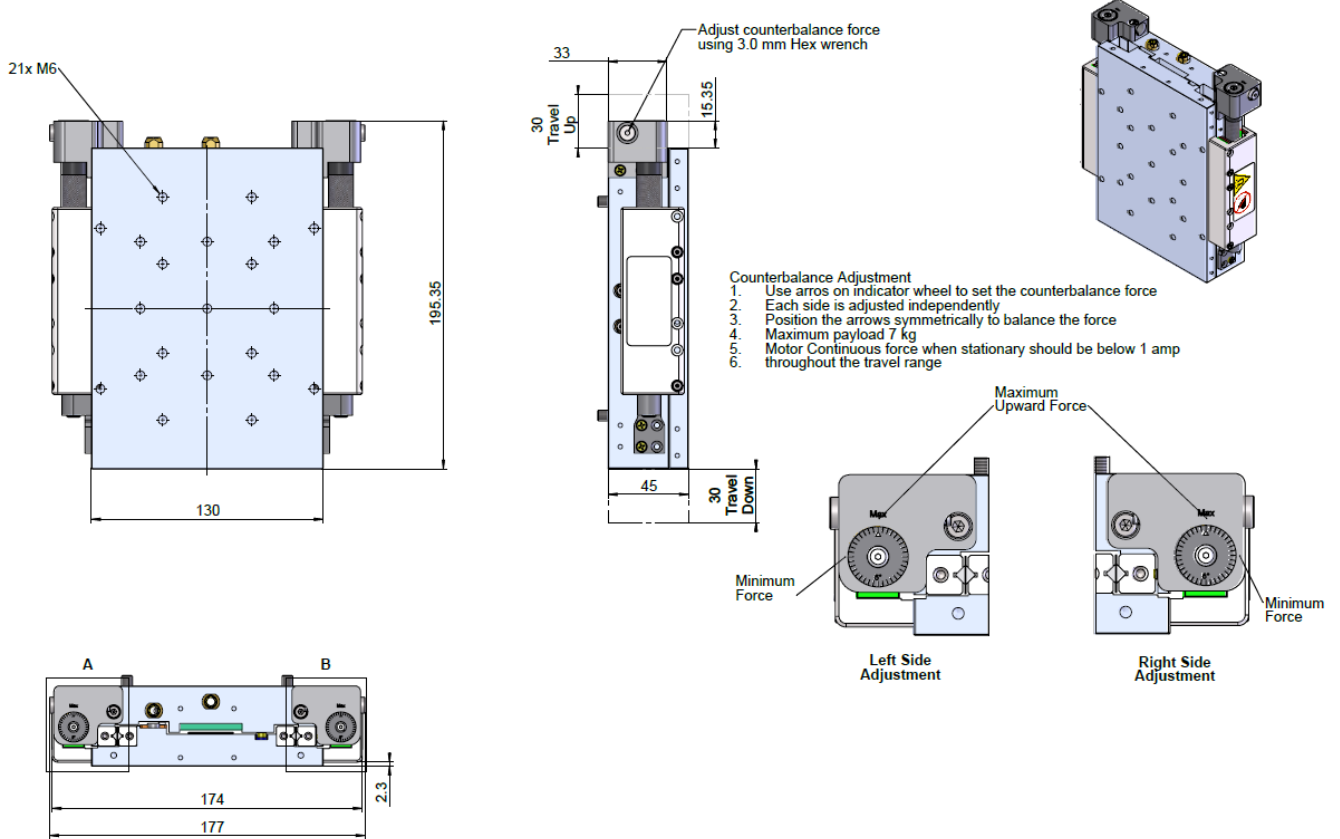
<sup>(2)</sup> The specified values are based on error compensation enabled by the PI controller. The positioner must be ordered with a controller from PI to reach these values. Accuracy values assume short-term duration and do not consider the long-term effects of thermal drift on the stage.

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

Measurement Sensor	V-572.xxxA1	V-572.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-572.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-85x Series

## Drawings / Images



V-572, dimensions in mm