

PIglide HS Planar Scanner with Air Bearing

XY Positioning System with 1 nm Resolution



A-322

- Ideal for scanning applications or high-precision positioning
- Cleanroom compatible
- Travel ranges to 500 mm × 1000 mm
- Load capacity to 245 N
- Resolution to 1 nm, Velocity to 2 m/s
- Three performance classes: Base, Plus, and Ultra

PIglide reference-class XY positioning system

The PIglide HS planar scanner has magnetic linear motors, vacuum preload, and an absolute encoder: Contact- and friction-free motion for the highest accuracy and reliability.

The positioning system was designed to maximize the throughput and ensure the highest precision. Flexible coupling of the bridge axis to the gantry axis allows lateral decoupling without sacrificing the stiffness of the system.

The A-322 is coupled with industry-leading controllers and drive modules from ACS that offer superior servo performance, advanced control algorithms to improve dynamic performance and error compensation, and a wide suite of software development tools.

The A-322 series is a starting point for further adaptations. Critical core components such as linear motors, measuring systems, and air bearing assemblies have already been developed, tested, and have proven their capabilities. Depending on the application and requirements of the customer, a variant of the A-322 series forms the ideal starting point for a tailor-made, ultraprecise solution.

3 performance and price classes

- Base: XY gantry design with 3 standard linear motors.
- Plus: XY gantry design with 3 liquid-cooled, high-performance linear motors. For applications with a high duty cycle and high accelerations.
- Ultra: XY gantry design with 4 liquid-cooled, high-performance linear motors. Both the X and the Y axis have 2 linear motors and 2 linear encoders each. This design improves the positioning accuracy, repeatability, and error compensation, in particular for loads with large dimensions.

Absolute encoder

Absolute encoders supply explicit position information that enables immediate determination of the position. This means that referencing is not required during switch-on, which increases efficiency and safety during operation.

PIMag® magnetic direct drive

3-phase magnetic direct drives do not use mechanical components in the drivetrain, they transmit the drive force to the motion platform directly and without friction. The drives reach high velocities and accelerations. Ironless motors are particularly suitable for positioning tasks with the highest demands on precision because there is no undesirable interaction with the permanent magnets. This allows smooth running even at the lowest velocities and at the same time, there is no vibration at high velocities. Nonlinearity in control behavior is avoided and any position can be controlled easily. The drive force can be set freely.

Accessories and options

- PIGlide Filter and Air Preparation Kits
- Additional axes
- Machine bases
- Base plates made of granite and systems for reducing vibration
- Suitable mounts for additional positioners such as tip/tilt platforms or 6-axis positioners with piezo drives.

Long lifetime, cleanroom compatible drag chains

The A-322 has high-quality, long-lasting ribbon cables and pneumatic hoses. Extensive research and development has resulted in an optimized cable management system that enables millions of maintenance-free cycles. Teflon coating ensures low particle formation.

Application fields

PIGlide positioning systems are ideally suited for many high-precision applications, such as metrology, photonics, and precision scanning as well as in semiconductor or flat panel display manufacturing.

Thanks to the friction-free motion, no particles are formed, which makes PIGlide stages ideal for cleanroom applications.

Specifications

Model	Unit	A-322 Base	A-322 Plus	A-322 Ultra
Precision/dynamics		Standard/standard	Standard/high	High/high
Motion				
Travel range, bridge axis	mm	350; 500	350; 500	350; 500
Travel range, gantry axis	mm	350; 500	350; 500; 750	350; 500; 750; 1000
Size of the motion platform		250 × 268	250 × 268	250 × 318
Guide		Air bearing, with vacuum preload	Air bearing, with vacuum preload	Air bearing, with vacuum preload
Integrated sensor		Absolute linear encoder, BiSS-C, steel measuring gauge	Absolute linear encoder, BiSS-C, steel measuring gauge	Absolute linear encoder, BiSS-C, steel measuring gauge
Sensor resolution	nm	1	1	1
Load capacity	kg	15	20	30
Bidirectional repeatability ⁽²⁾	µm	±0.15	±0.15	±0.05
Positioning accuracy, calibrated ⁽²⁾	µm	±0.35	±0.35	±0.2
Straightness ⁽²⁾	µm	1	1	0.5
Flatness	µm	2	2	2
Pitch	µrad	10	10	10
Yaw ⁽²⁾	µrad	5	5	2
XY orthogonality	µrad	5	5	2
Max. velocity, unloaded ⁽³⁾	m/s	0.5	1	1
Max. acceleration, unloaded ⁽³⁾	m/s ²	10	20	20/15 (bridge/gantry axis)

Model	Unit	A-322 Base	A-322 Plus	A-322 Ultra
Position stability	nm	±30	±30	±30
Moved mass, bridge axis	kg	14	14	20
Moved mass, gantry axis	kg	Depending on the travel range of the bridge axis: 350 mm: 40 kg 500 mm: 44 kg	Depending on the travel range of the bridge axis: 350 mm: 53 kg 500 mm: 56 kg	Depending on the travel range of the bridge axis: 350 mm: 70 kg 500 mm: 75 kg

⁽¹⁾ Assumes an air bearing operating pressure of 550 kPa. The payload center of gravity may not be more than 50 mm away from the surface of the motion platform.

⁽²⁾ Requires controller-based error compensation. Positioner must be ordered with a PI / ACS controller. Values assume short duration and do not consider the long-term effects of thermal drift on the stage.

⁽³⁾ Depends on the motor selected, controller performance, duty cycle, load, and other application-specific parameters. Acceleration, duty cycle, and motion profile should be agreed with a PI application engineer.

Overall weight depends on the customer-specific granite base.

Values serve as examples for a travel range of 500 mm × 500 mm. Contact PI for the exact specifications for other travel ranges.

Drive properties (per motor)	Unit	A-322 Base Bridge/gantry axis	A-322 Plus Bridge/gantry axis	A-322 Ultra Bridge/gantry axis
Number of motors		1× bridge, 2× gantry axis	1× bridge, 2× gantry axis	2× bridge, 2× gantry axis
Nominal voltage, DC	V	70/70	70/70	70/70
Peak voltage, DC	V	300/300	300/300	300/300
Nominal force	N	87/87	140/140	87/140
Peak force	N	300/300	480/480	300/480
Force constant, RMS	N/A	19.9/19.9	27.5/27.5	19.9/27.5
Nominal current, RMS	A	4.4/4.4	5.1/5.1	4.4/5.1
Peak current, RMS	A	15/15	17.5/17.5	15/17.5
Back EMF, phase-phase	V·s/m	16/16	22.5/22.5	16/22.5
Resistance, phase-phase	Ω	3.6/3.6	2.6/2.6	3.6/2.6
Inductance, phase-phase	mH	1.2/1.2	2.0/2.0	1.2/2.0
Cooling system		–	Water, 20°C, 2 to 3 l/min	Water, 20°C, 2 to 3 l/min

Miscellaneous	A-322 (all models)
Operating pressure	550 ±35 kPa (80 ±5 psi)
Air consumption	With external vacuum supply: 56 l/min (2 SCFM) With internally generated vacuum: 112 l/min (4 SCFM)
Vacuum	74.66 kPa (560 mmHg), 14 l/min (0.5 SCFM)
Air quality	Clean (filtered to 1.0 µm or better) - ISO 8573-1 Class 1 Oil free - ISO 8573-1 Class 1 Dry (-15 °C dew point) - ISO 8573-1 Class 3
Materials	Granite base Hardcoat aluminum Nickel-plated steel side rails Mounting hardware made of stainless steel

Ordering Information

A-322 Base

PIglide HS planar scanner, air bearing, 3-phase linear motors, absolute linear encoder, travel range to 500 mm × 500 mm (please specify in the request)

A-322 Plus

PIglide HS planar scanner, air bearings, liquid-cooled, high-performance 3-phase linear motors, absolute linear encoder, travel range to 500 mm × 750 mm (please specify in the request)

A-322 Ultra

PIglide HS planar scanner, XY dual gantry design, air bearings, liquid-cooled, high-performance 3-phase linear motors, absolute linear encoder, travel range to 500 mm × 1000 mm (please specify in request)