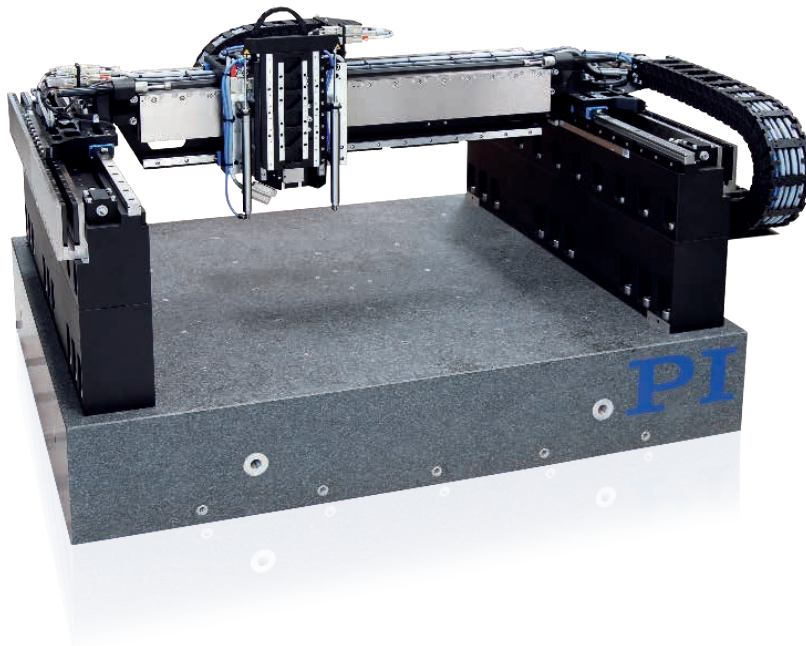


Engineered Precision Motion Systems



Gantry Solutions

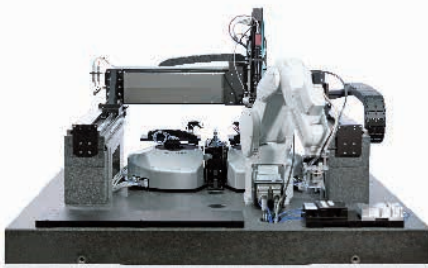
LASER MATERIAL PROCESSING, WAFER INSPECTION AND ELECTRONICS ASSEMBLY

Engineered Motion & Positioning Solutions



Precision components, stable control and a great deal of experience in engineering are essential for high-precision complex motion and positioning solutions. PI is a supplier of technologically sophisticated drive components and high-precision positioners and also offers all levels of integration up to the turnkey solution.

Engineering services have been a part of PI's core business for many years. Complete solutions, fitting seamlessly into existing processes, advance automation in major research installations as well as manufacturing and inspection processes for chip production or photonics packaging.



Complex multi-axis designs and fully integrated systems are available, like this assembly system for photonics packaging

Core Competences

- Application support and consulting for motion and positioning applications
- Reliable and prompt series production even for large quantities
- Economic design
- Commissioning of turnkey solutions
- Complex multi-axis designs and parallel kinematic robotics
- Broad spectrum of technologies: Drive, guide, and sensor technologies
- In-house motion control electronics and software platform
- Customized software integration such as Epics, LabVIEW, Tango, ...

Throughput, Precision and Reliability

Solutions for Motion-Centric Industrial Automation



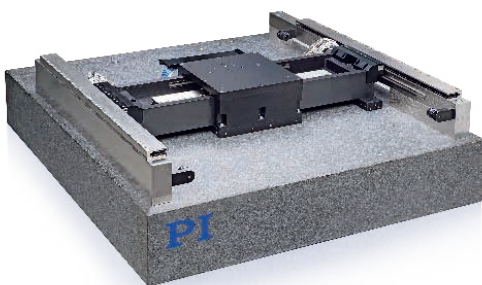
XY and Portal Systems from PI

Positioning and motion tasks in industrial automation such as those in assembly, semiconductor manufacturing, mechanical engineering, laser material processing, inspection systems or in additive manufacturing demand solutions that need to be robust and reliable.

PI offers a broad range of in-house drive and motion control technologies such as EtherCAT-based industrial controllers by ACS, where PI holds the major shares, or air bearing technology for optimized guiding accuracy. System engineering for customization and a global service and training network are added-value offers. PI is therefore the ideal partner for motion-centric industrial solutions.

Smarter Motion & Positioning

ACS is a worldwide leading developer and manufacturer of modular motion controllers for multi-axis drive systems. The partnership with ACS has put PI into a position to supply customized complete systems for industrial applications with the highest demands on precision and dynamics and also to add its extensive experience in high-end projects for industrial applications intended to combine precision, productivity, and reliability all over the world.



A-322 Piglide XY stage with ironless linear motors and air bearing technology

Air bearing technology provides

- Frictionless high-precision positioning
- Excellent velocity stability
- Excellent guiding accuracy up to 5 μ rad/100 mm
- Optional active yaw control for gantries
- Direct drive linear & torque motors for smooth, high speed scanning

Experience that matters for OEMs. PI is building on over 200 man-years of in-house air bearing experience and offers comprehensive precision air bearing motion control and positioning products and systems.

Stitching-Free Wide-Field Laser Scanning

High Accuracy and Ultimate Throughput

Together with SCANLAB and ACS, PI offers a motion control solution for laser material processing, which combines the laser beam scanner and sample scanner, provides the ability to mark and process large pieces with very high precision and an ultimate throughput.

Key Advantages

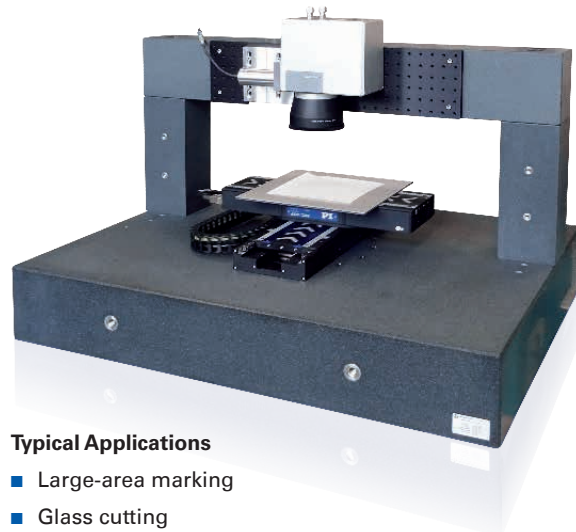
- Large field of view, wide range of XY stages
- Significantly increased throughput (up to 41% compared with conventional systems)
- No stitching errors
- Higher precision
- Smooth processing with high dynamics and no stage vibrations high speed scanning



Stitching motion



Simultaneous movement



Typical Applications

- Large-area marking
- Glass cutting
- Drilling of large-area PCBs

No Stitching Errors

Piecemeal processing (stitching) of large workpieces is prone to marking displacement near the edges of adjacent fields. By combining the motion of the scan head with the motion of the XY stage, stitching errors are eliminated and in addition the process time is shortened significantly (image by SCANLAB).

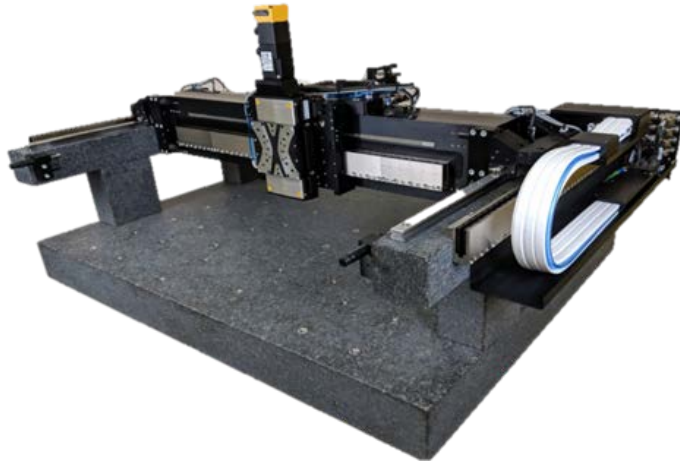
Powered by ACS and SCANLAB

The jointly developed syncAXIS control software enables simultaneous control of a 2D scan head and a 2D scanning stage equipped with high-dynamic magnetic linear drives. The combined system substantially increases the image field size for wide-area marking, and in addition provides superior capabilities for cutting of glass, drilling of large PCBs and laser micro-machining. Unlike tiled processing, this innovative laser processing system with an extended image field can significantly slash process times, thereby delivering enhanced productivity and cost reduction in manufacturing.



PIglide HGS: Hybrid Gantry XY / XYZ Stage

FRICTIONLESS, IDEAL FOR 3D PRINTING, PICK-AND-PLACE / ALIGNMENT / INSPECTION



A-341 Series

- Overhead Moving XY Gantry
- Hybrid Bearing Design: Air Bearing Scan Axis, Ball Bearing Step Axis
- Absolute Encoders Standard
- Array of Travels, Options, and Customizations
- Flexible, Modular Platform

Overview

The PIglide HGS hybrid gantry stage has been designed to maximize throughput for applications requiring overhead motion. This stage is ideal for 3D printing, assembly, pick-and-place, alignment, or inspection applications.

The gantry axis incorporates dual linear motors and dual linear encoders. Ironless linear motors provide smooth motion and no cogging or attractive forces.

The HGS is coupled with industry-leading ACS controls and drives that offer superior servo performance, advanced control algorithms to improve dynamic performance and error compensation, and a wide suite of software development tools.

The HGS features a unique hybrid bearing design. The cross axis uses a frictionless air bearing guiding system, which allows for excellent velocity control, repeatability, straightness, and cleanliness. The lower dual-motor axis uses precision mechanical linear bearings for rigidity and precision in a compact space. This combination of bearing technologies offers an overhead gantry motion platform optimized for step and scan applications in the smallest possible form factor.



The [A-824 motion controller](#) offers a fully integrated electronics solution with controller, drives, and power supplies in a compact 4-U-high 19-inch rack unit. It is based on the ACS SPiiPlus architecture and provides EtherCat® connectivity.

Options and Customizations

- Granite or aluminum base
- Working height
- Vibration isolation systems
- Various Z Axis options
- Additional cable carriers
- Motor sizes
- Water cooling on one or all three motors

Specifications

Motion	Units	Cross Axis	Gantry Axis
Travel Range (nominal) (Any combination)	mm	300, 500	300, 500, 750, 1000
Guiding System	-	Air bearing, fully preloaded	Recirculating ball bearing
Drive	-	1x Linear 3-phase ironless linear motor	2x Linear 3-phase ironless linear motor
Feedback	-	1x Linear optical absolute encoder, BiSS-C, 1nm resolution, steel scale	2x Linear optical absolute encoder, BiSS- C, 1nm resolution, steel scale
Moving Table Size	mm	210 wide x 175 tall	
Load Capacity ⁽³⁾	kg	10	
Positioning Accuracy ⁽¹⁾	µm	±0.75	±2.0
Repeatability, Bi-directional ⁽¹⁾	µm	±0.3	±1.0
Orthogonality, XY	µrad	25	
Max Velocity, unloaded ⁽²⁾	m/sec	2	1
Moved mass	kg	5	300mm cross travel: 25 500mm cross travel: 30

1. Values shown assume controller-based error compensation. Values assume short-term time duration and do not consider the long-term effects of thermal drift on the stage.
2. Velocity will be dependent on motor option, controller power, duty cycle, payload, and other application-specific parameters.
3. Value shown assumes air supply pressure of 550 kPa (80 psi). Payload CG must be no more than 50mm from stage table.

Motor (per coil)	Units	-1 Option	-2 Option
Bus Voltage	VDC	70 nominal / 300 maximum	
Force Constant	N/A _{rms}	19.9	19.9
Continuous Force	N	58	87
Peak Force (> 1 sec)	N	200	300
Continuous Current	A _{rms}	2.9	4.4
Peak Current (> 1 sec)	A _{rms}	10	15
Back EMF	V/m/sec	16	16
Resistance (phase-to-phase)	Ω	5.6	3.6
Inductance (phase-to-phase)	mH	1.8	1.2

Misc	
Operating Pressure	550 +/-35 kPa (80 +/-5 psi)
Air Consumption	< 30 liters/minute (1.0 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
Construction	Hardcoat Aluminum Steel linear bearing rails, cleanroom grease (optional stainless rails available) SS Fasteners

Options

Z Axis Stage

Integrated Z (vertical) axis mounted to the gantry. Options include:

L-511 ballscrew driven stage, brushless servomotor with brake, 50-150mm travel

V-408 linear motor driven stage, 50mm travel, with pneumatic counterbalance and brake

Cable Carriers

In addition to the standard integrated flat-flex cable loops, additional e-chain cable carriers can be added to both axes to accommodate customer cables and tubes.

Motor Cooling

For high acceleration / high duty cycle applications, water cooling jackets can be added to the linear motors. Water cooling can be applied to only the cross axis motor, or to all three motors. An external water chiller is required.

Base Structure Materials

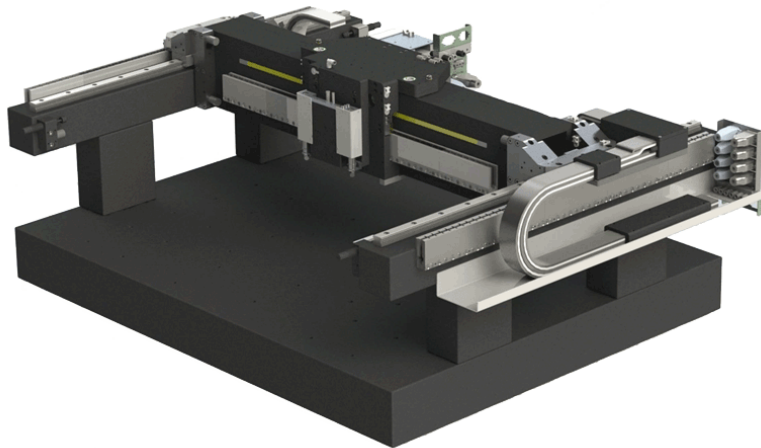
Gantry base plate and risers can be made with either granite or aluminum. In either case, customer-defined hole patterns are available.

Version with Linear Recirculating Ball Bearings and Linear Motors

A variation of the A-341 hybrid gantry with linear recirculating ball bearings on both the step and scan axes is available as the A-351.

Pliglide MGS: Linear Motor Gantry Stage

FRICTIONLESS, IDEAL FOR 3D PRINTING, PICK-AND-PLACE / ALIGNMENT / INSPECTION



A-351 Series

- Overhead Moving XY Gantry
- Linear Recirculating Ball Bearings
- Absolute Encoders Standard
- Array of Travels, Options, and Customizations
- Flexible, Modular Platform

Overview

The Pliglide MGS gantry stage has been designed to maximize throughput for applications requiring overhead motion. This stage is ideal for 3D printing, assembly, pick-and-place, alignment, inspection, and industrial automation applications.

The MGS uses preloaded linear mechanical bearings which are designed to provide optimized stiffness and precision. Optional stainless steel rails can be included.

The gantry axis incorporates dual linear motors and dual linear encoders. Ironless linear motors provide smooth motion and no cogging or attractive forces. The linear motor and linear encoders are noncontact devices, so there is no backlash, wear or maintenance concerns.

The MGS is coupled with industry-leading ACS controls and drives 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-824 motion controller](#) offers a fully integrated electronics solution with controller, drives, and power supplies in a compact 4-U-high 19-inch rack unit. It is based on the ACS SPiiPlus architecture and provides EtherCat® connectivity.

Options and Customizations

- Granite or aluminum base
- Working height
- Vibration isolation systems
- Various Z Axis options
- Additional cable carriers
- Motor sizes
- Water cooling on one or all three motors

Specifications

Motion	Units	Cross Axis	Gantry Axis
Travel Range (nominal) (Any combination)	mm	300, 500	300, 500, 750, 1000
Guiding System	-	Recirculating ball bearing	
Drive	-	1x Linear 3-phase ironless linear motor	2x Linear 3-phase ironless linear motor
Feedback	-	1x Linear optical absolute encoder, BiSS-C, 1nm resolution, steel scale	2x Linear optical absolute encoder, BiSS-C, 1nm resolution, steel scale
Moving Table Size	mm	210 wide x 175 tall	
Load Capacity ⁽³⁾	kg	20	
Positioning Accuracy ⁽¹⁾	µm	±2.0	±2.0
Repeatability, Bi-directional ⁽¹⁾	µm	±1.0	±1.0
Orthogonality, XY	µrad	25	
Max Velocity, unloaded ⁽²⁾	m/sec	2	1
Moved mass	kg	4.5	300mm cross travel: 25 500mm cross travel: 30

1. Values shown assume controller-based error compensation. Values assume short-term time duration and do not consider the long-term effects of thermal drift on the stage.
2. Velocity will be dependent on motor option, controller power, duty cycle, payload, and other application-specific parameters.
3. Value shown assumes air supply pressure of 550 kPa (80 psi). Payload CG must be no more than 50mm from stage table.

Motor (per coil)	Units	-1 Option	-2 Option
Bus Voltage	VDC	70 nominal / 300 maximum	
Force Constant	N/A _{rms}	19.9	19.9
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Back EMF	V/m/sec	16	16
Resistance (phase-to-phase)	Ω	5.6	3.6
Inductance (phase-to-phase)	mH	1.8	1.2

Misc	
Construction	Hardcoat Aluminum Steel linear bearing rails, cleanroom grease (optional stainless rails available) SS Fasteners

Options

Z Axis Stage

Integrated Z (vertical) axis mounted to the gantry. Options include:

L-511 ballscrew driven stage, brushless servomotor with brake, 50-150mm travel

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Cable Carriers

In addition to the standard integrated flat-flex cable loops, additional e-chain cable carriers can be added to both axes to accommodate customer cables and tubes.

Motor Cooling

For high acceleration / high duty cycle applications, water cooling jackets can be added to the linear motors. Water cooling can be applied to only the cross axis motor, or to all three motors. An external water chiller is required.

Base Structure Materials

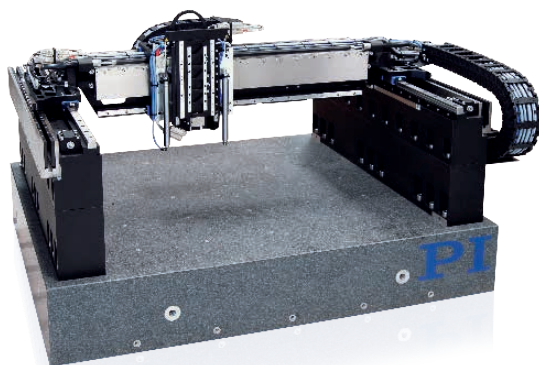
Gantry base plate and risers can be made with either granite or aluminum. In either case, customer-defined hole patterns are available.

Hybrid Gantry with Air Bearings and Ball Bearings

A variation of the A-351 linear motor gantry with air bearings on the scan axis (cross axis) is available as the [A-341](#).

PIMag[®] Gantry System

High-Dynamic Precision Positioning in 3 Axes



- Vertical axis with pneumatic counter weight
- 508 mm x 508 mm x155 mm travel range
- Ironless linearmotors
- Direct measuring incremental linear encoders
- Controlled by ACS

Preliminary Specifications				Unit	Tolerance
Active axes	X	Y	Z		
Motion and positioning					
Travel range	508	508	155	mm	
Integrated sensor	Optical linear encoder, incremental	Optical linear encoder, incremental	Optical linear encoder, incremental		
Sensor resolution	0.002	0.002	0.002	µm	
Unidirectional repeatability	0.5	0.5	0.5	µm	typ.
Max. velocity*)	3000	3000	2000	mm/s	typ.
Max. acceleration**)	30	30	20	m/s ²	typ.
Mechanical properties					
Bearings	Ball bearing	Ball bearing	Cross roller bearings		
Load capacity	5			kg	max.
Motor type	Ironless linear motor	Ironless linear motor	Ironless linear motor with pneumatic counterbalance		
Miscellaneous					
Feedback	20 µm sin/cos	20 µm sin/cos	20 µm sin/cos		
Material of base	Granite				

* Maximum speed based on stage capability. Maximum application velocity may be limited by system data rate and system resolution. Maximum speed of the z-axis is specified without pneumatic counterbalance.

** No load. Maximum acceleration of the z-axis is specified without pneumatic counterbalance.

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Well-Positioned All Over the World

The PI Group is present in all key technology regions world-wide. Its local representations around the globe are more than just sales agencies. Customers benefit from this in many ways:

- Service facilities for diagnosis and repair as well as metrology equipment for tests, system calibration and quality assurance
- R&D departments, which are able to react promptly to the demands of the local markets and ensure a direct dialog with the customers
- Sample and prototype construction – in close contact with development departments and customers
- Sales and application engineers – experts for the entire product portfolio of the PI Group and your contact for customized developments – from the initial consultation to the delivery
- Market and business development experts who listen to what customers in specific market segments want and enable the PI Group to develop products that fulfill these requirements.

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