Positioning Systems

Customized Positioning Systems

The standardized positioning axes presented in this catalogue make it possible to handle many kinds of positioning tasks. For positioning tasks, that cannot be solved using standard axes, application engineers are available to work out an optimized solution for customers. The inquiry form at the end of this catalogue serves to help our application engineers make a preliminary design.

A sampling of customized solutions is shown here. In several examples, mechanics are not the only parts customized. For instance, with the planar motors, special software is developed in order to obtain optimal integration of the positioning system to the production process.

1.1 Examples

Economical Pick & Place and Inspection

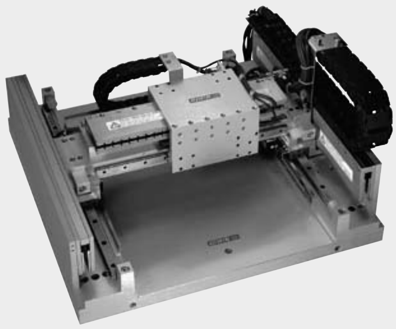
XY gantry systems are economical for many applications. Gantry axes are assembled from standard components.

- Standard axes of the LMX1L series
- Repeatability ± 2 µm
- Delivery with base frame.

Microshapes and Macroshapes

Milling of microstructures with cutting tools and lasers are application areas in which gantry systems excel. They are also very economical to implement.

- Coreless motors LMC
- Repeatability ± 2 µm
- Technology proven through countless worldwide installations



Planar Motors

Servo-planar motors provide an excellent technological platform for inspection tasks. During inspection of circuit boards, optical sensors are integrated to completely monitor the printed conductive tracks and SMD components.

- Virtually no wear due to an air-cushion bearing
- Guaranteed levelness for the complete stroke path (up to 1000 mm x 1000 mm)
- Repeatability ± 3 µm

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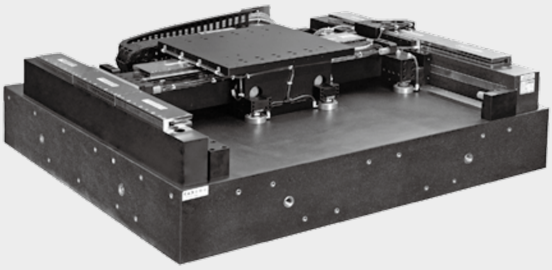
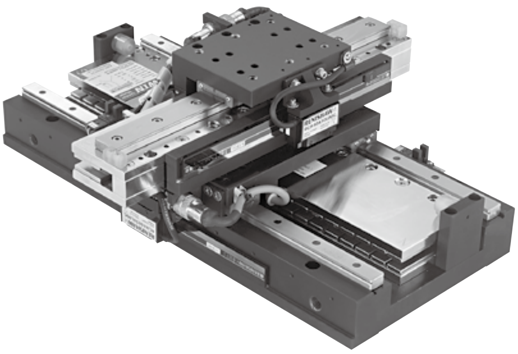


Wafer Quality Control and Mask Production at the Highest Level

High precision cross stages with air-bearings are the prerequisites for surface monitoring and mask procuction, to find even the smallest errors, to produce precision masks, in wafer production for the electronics, chip and flat panel industries.

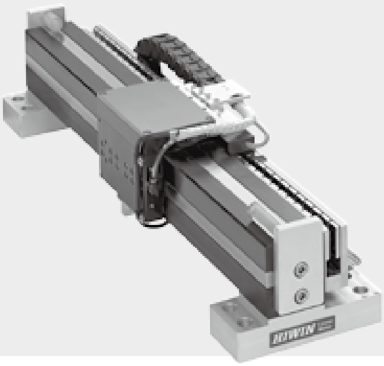
- Flatness ±2 µm
- Repeatability ±0.5 µm
- Accuracy ±1.5 µm



Microsystem Technology and Wafer Processing

Absolute precision and suitability for clean room conditions are the prerequisites for every drive in microsystem technology and wafer processing. Linear motor cross stages meet these requirements.

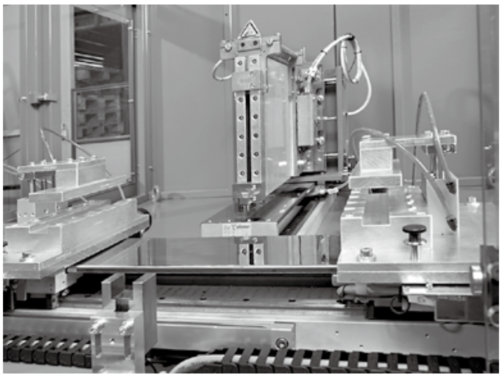
- Stroke 200 mm x 200 mm, optional 300 mm x 300 mm
- Levelness ± 4 µm across the complete stroke
- Repeatability ± 1 µm across both axes
- Accuracy ± 4 µm across both axes
- Clean room suitability class 100; optional class 10



Laser Scanners

Extremely smooth motion and long operating life are a must for optical inspection systems such as laser scanners. Linear motor stages with air bearings fulfill these requirements.

- Frictionless air cushions
- Coreless linear motors are not effected by cogging.
- Stroke up to 1,500 mm



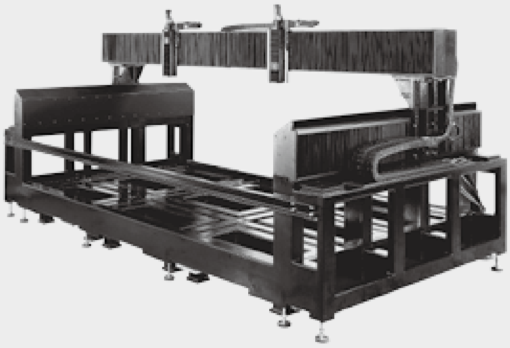
Horizontal high-speed hot weld machine for welding synthetic materials

Linear motor stages of the LMX1L series with absolute position measurement offer:

- No commutation required at power up
- No "drawing" of the synthetic material when removed from the heated plate
- Welding is controlled by time, force and path
- Lower changeover times due to higher speeds

Water jet application
LMS double forcer linear stage provides 2.5m stroke and carries two Hiwin KK stages on the Z-axis. The lower 2 axes are also equipped with LMS high thrust liner motors and run under synchronization.

- No commutation required at power up
- Large stroke
- Delivered with base frame, cover and high end motion controller

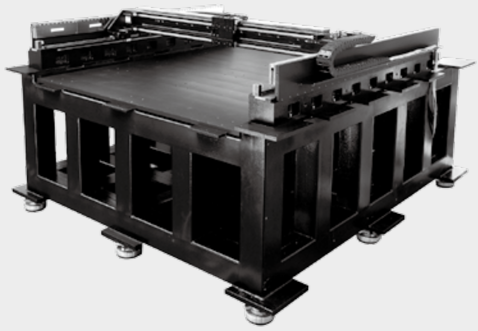


Total solution for AOI industry
LMC linear stage provides smooth motion for the special needs in AOI applications. With the LMS linear stage mounted to the upper axis, the ballscrew driven Z-axis integrated with a CCD camera can attain high speeds.

- Repeatability ±1 μm
- Velocity ripple below 1.5 %
- Delivery with base frame and cover

Custom made stage for glass working
The linear motor stage is designed to carry a working head to move above the flat table. The customer's working head is for cutting double layer glasses.

- Gantry structure linear motor positioning stage for Gen. 5 glass
- 1300 mm x 1450 mm stroke
- Smooth motion
- Sinusoidal commutation and no cogging
- LMC series motors
- Repeatablility ± 2μm
- Rigid base structure



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1.2 Glossary

Acceleration
This is the speed change per time unit, i.e., acceleration = speed / time or a = v / t.

Acceleration time
This is defined as the time a drive requires from start until achieving maximum speed.

Accuracy
This, or actually the better terminology, the inaccuracy, corresponds to the deviation between target and actual position. The accuracy along an axis is defined as the remaining difference of target and actual position, after other linear deviations are excluded. Such systematic or linear deviations can be caused by cosine error, angle deviation, ball screw error, thermal expansion, etc. For all target positions of interest in an application, it is calculated with the following formula:
Maximum of sum of systematic target-actual-difference
+ 2 sigma (standard deviation)
Please do not confuse accuracy with repeatablity.

Attraction force F_a
This is created between the primary and secondary parts of the iron-core linear motors which must be taken up by the guide.

Back emf constant
(see also Chapter 1.3, K_v)
This is the ratio of the back emf voltage (rms) to the motor rotational speed or linear speed (rpm or m/s). The back emf is the electromagnetic force, which is created at the movement of the coil in the magnetic field of permanent magnets, e.g. in a servomotor.

Continuous torque, continuous force
(see also Chapter 1.3, F_c)
Or also nominal torque, nominal force. This is the torque or force, that rotary or linear motors can produce in continuous operation (duty cycle = 100%).

Continuous current
(also see Chapter 1.3, I_c)
It is a current that flows over longer time into motor. The maximum allowed current into each coil is also called nominal current. It is characterized when the generated heat results in motor warming of up to 80 °C.

Eccentricity
This is the deviation of the center point of rotation of rotary tables from their position during rotation. It is created by centering and bearing tolerances.

Force, torque
Force (in linear movements) or torque (in rotational movements) is given for defined conditions, e.g., as continuous force or torque at:
- 20 °C ambient temperature
- 80 °C winding temperature
- 100% duty cycle

or as peak force or peak torque.

Force constant K_f
(see also Chapter 1.3, K_f)
This is a coil specific constant. The motor output force can be calculated by multiplying the force constant of the motor by input current: $F = I \times K_f$

Guide deviation
This is the deviation from the axis of stroke. It depends on horizontal straightness (also straightness) and vertical straightness (also flatness).

Horizontal straightness
It is a measure for horizontal straightness when moving in X-axis. If there is deviation in horizontal straightness, there would be positioning error in Y-axis, as the system moves along X-axis.

Motor constant K_m
(see also Chapter 1.3, K_m)
This designates the ratio of generated force and dissipation power and consequently is a measure of efficiency for a motor.

Peak current I_p
(see also Chapter 1.3, I_p)
This current is applied to coils for a short time to generate peak force. HIWIN defines it to be the following: For iron core type motors, I_p is 2 times the allowed continuous current. For coreless types, it is 3 times the allowed continuous current. The maximum time for applying peak current is 1 second. After that, motor has to cool down to nominal operating temperature, before further peak current could be applied again.