Dynamic Motion and Scanning in Six Axes

Motion simulators have higher motion dynamics requirements (shakers). They repeatedly perform defined motion cycles, for example for quality assurance and function monitoring of products in mobile use. Motions that are generated, for example, by trembling hands or a moving car, are simulated by means of sine curves and freely definable trajectories.

Six degrees of freedom allow fast motion sequences to be repeated identically in different locations of the workspace.

Applications

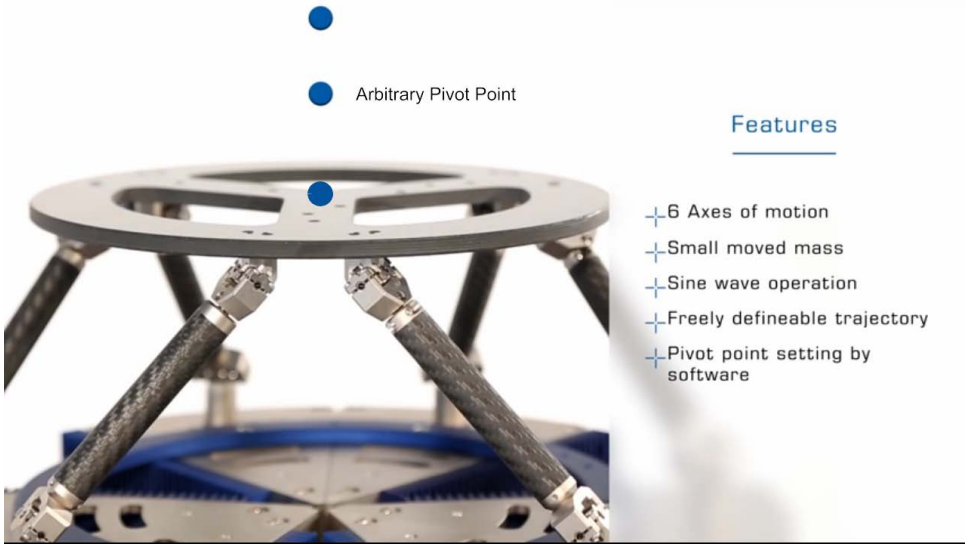
Testing of image stabilization algorithms in camera systems, also for mobile devices. In the process, the Camera & Imaging Products Association (CIPA) Standards must be taken into account.

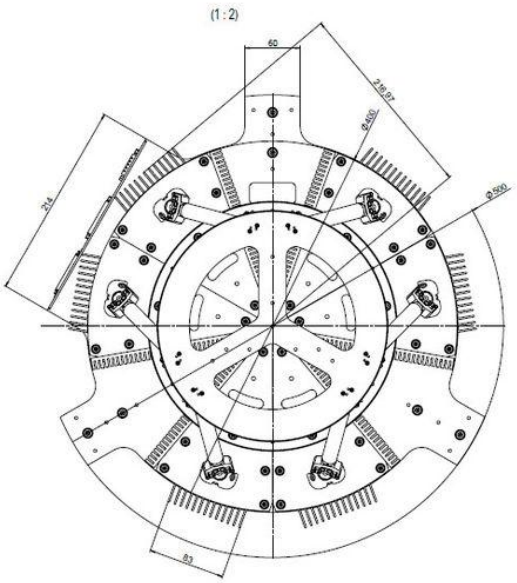
Simulation of oscillations, e.g. eye motion simulation and eye tracking in the medical field.

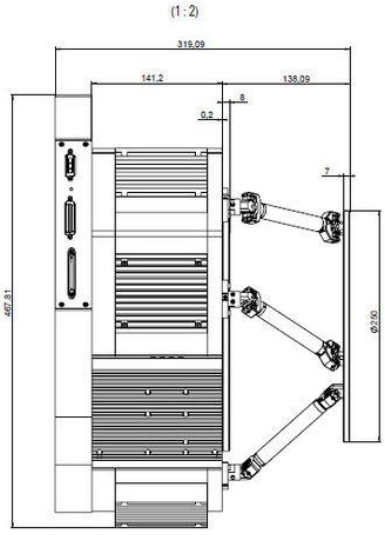
Drive Principles

To generate highly dynamic motions, various drive principles can be used. Hexapods with **electromagnetic, brushless torque motors** and an appropriate mechanical design of the drive train and sensor system can already provide velocities of up to 25 mm/s and accelerations of up to 2 g.

The best dynamic performance is achieved by Hexapods with **magnetic PIMag® direct drives**; they offer velocities of several hundred mm/s and accelerations of up to 4 g. The special design which includes flexure joints completely dispenses







H-850KMAG, dimensions in mm

High- Dynamics Shaker Hexapod for Motion Simulation

MAGNETIC DIRECT DRIVE FOR HIGH VELOCITY

H-860KMAG

- Dynamics to 25 Hz over 0.1° travel range
- Integrated wave generator
- Developed for test stations for image stabilization
- Low moved mass
- Velocity >250 mm/ s
- Freely programmable, virtual pivot point

Reference- class 6- axis positioning system

Parallel- kinematic design for six degrees of freedom making it significantly more compact and stiffer than serial-kinematic systems, no moved cables.

Precise running of predefined motion profiles with high path accuracy: Sine curves and freely definable trajectories. Digital I/ O interfaces for trigger signal emission

Powerful digital controller, open software architecture

User- defined, stable pivot point, software- selectable. Positions commanded in Cartesian coordinates. Macro programming. Open source LabVIEW driver set. Work space simulation software. Virtual Hexapod machine software. Optional: Collision avoidance software (external obstacles)

PIMag™ voice coil magnetic drive for high velocity and high dynamics

Noncontact magnetic drive principle, no frictional or rolling parts for guiding and joints. Zero- backlash positioning, no mechanical noise in the drivetrain. Silent. Low wear and high lifetime. Integrated linear encoder for reliable position control and repeatable accuracy. Fast and precise direction reversal through low moved mass and lightweight design (highly stiff, milled carbon parts)

Fields of application

Research and industry, test systems, e.g. for image stabilization in cameras and mobile devices. Equipment for camera test systems and image stabilization software, certification according to CIPA planned. Oscillation simulation, eye tracking, simulation of human and artificial motion.

Specifications

Preliminary Data	H-860KMAG	Unit	Tolerance
Active axes	X, Y, Z, θ_X, θ_Y, θ_Z		
Motion and positioning			
Travel range X, Y, Z	±7.5	mm	
Travel range θ_X, θ_Y, θ_Z	±4	°	
Integrated sensor	Linear encoder		
Velocity X, Y, Z	250	mm/ s	max.
Linear acceleration	4	g	
Load capacity	1	kg	max.
Resonant frequency F_X, F_Y, F_Z	200	Hz	
Drive properties			
Actuator drive / motor type	PIMag™ voice coil		
Motion and control			
Servo characteristics	32- bit PID filter		
Trajectory profile modes	Sine, freely definable trajectories		
Cycle time	1	ms	
Processor	CPU: ATOM Dual Core (1.8 GHz)		
Electrical properties			
Max. output power	10- bit outputs for PWM drivers, 30 kHz		
Max. output voltage	TTL in PWM operation for SIGN and MAGN		
Operating voltage	230	V	typ.
Power consumption	600	W	max.
Interface and operation			
Communication interfaces	TCP/ IP, RS-232 USB (keyboard, mouse, manual control unit)		
Command set	PI General Command Set (GCS)		
User software	PIMikroMove		
Software drivers	LabVIEW drivers, dynamic libraries for Windows and Linux		
Miscellaneous			
Operating temperature range	+5 to +40	°C	
Hexapod mass	30	kg	±5 %
Cable length	3	m	±10 mm
Controller mass	2.8	kg	±5 %

Technical data specified at 20 ±3 °C.

* The travel ranges of the individual coordinates (X, Y, Z, θ_X, θ_Y, θ_Z) are interdependent. The data for each axis in this table shows its maximum travel, where all other axes are at their zero positions. If the other linear or rotational coordinates are not zero, the available travel may be less.

Order Information

H-860KMAG
Hexapod Microrobot, Magnetic Direct Drive, 250 mm/ s, 1 kg Load, Cable Set 3 m, with 6D Controller for Hexapods, TCP/ IP and RS-232 Interface
Ask about custom designs!

Related Products

H-811.S11 6- Axis Motion Hexapod
H-820 6- Axis Positioner with Controller
H-840 6- Axis Hexapod

Technology

Hexapod as Motion Simulator | Motion simulators have higher motion dynamics requirements (shakers). Learn more ...

PIMag® Magnetic Direct Drives

Dynamic, Cost-Efficient and Bespoke

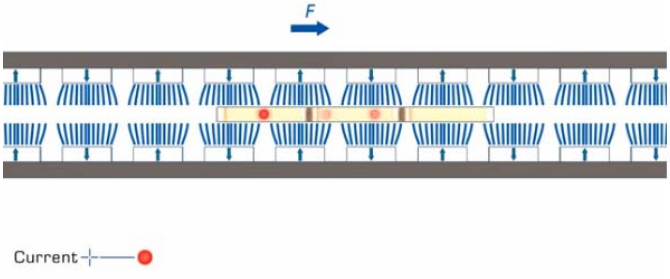
In particular in terms of wear and dynamics, magnetic direct drives offer advantages compared to common spindle-based technologies. Since they use as few mechanical components as possible, this results in less friction and backlash and thus more precision.

System components like stator, actuator or electronics are adapted individually by PI to the respective applications for the **PIMag® series**.

These bespoke solutions can be of benefit in many areas of automation and handling technology, for example, tip/tilt mirror, dosing, inspection and focusing applications, endoscopes or space telescopes.

Voice-Coil Drives

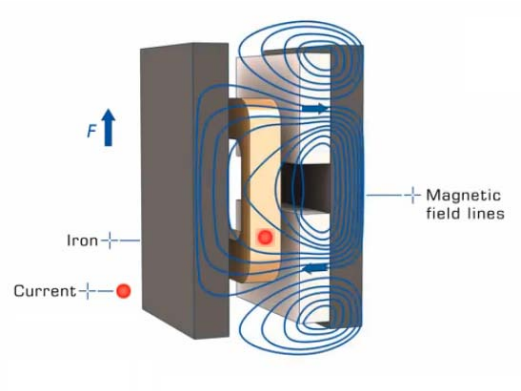
These friction-free electromagnetic linear drives are characterized by their good dynamics, albeit with relatively low holding force. They are used primarily in scanning applications with travel ranges up to several ten millimeters .



Magnetic linear drive with force sensor

The magnetic miniature drive with hollow shaft is intended for use in medical endoscopes

Features of the PIMag® Drives



Voice-coil actuators and magnetic linear drives utilize the fact that the force acting on a current carrying conductor in a magnetic field is proportional to the strength of the +magnetic field and the current. The electrical energy is converted into mechanical energy and generates a force which can act bidirectionally, depending on the direction of the current. In particular in terms of wear and dynamics, this mode of function offer advantages compared to common spindle-based technologies. As it largely dispenses with the use of few mechanical components, this results in less friction and backlash and thus more precision. At the same time it lowers costs and increases energy efficiency.