Hexapods

CSA Engineering

Platforms for Vibration and Motion Control

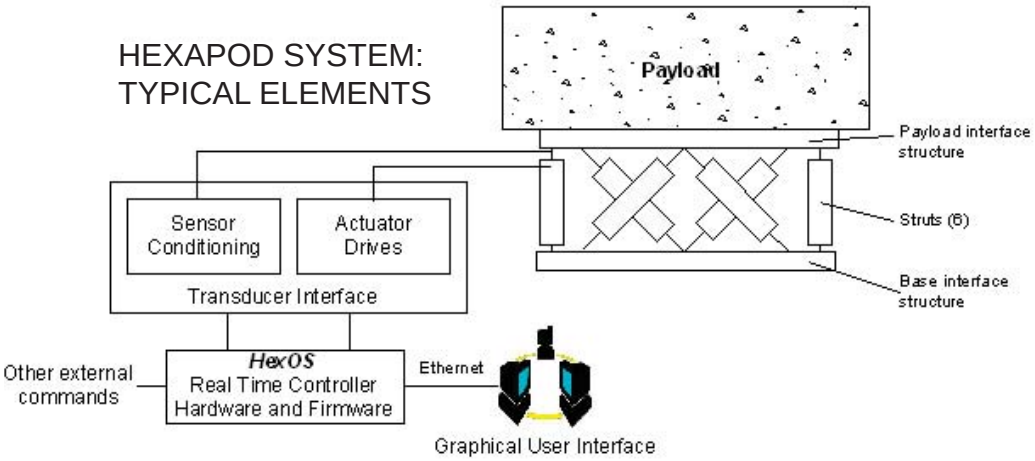
Hexapods are six degree of freedom positioning systems that offer high load carrying capacity, controllable stiffness, and built-in redundancy. The hexapod is a type of parallel manipulator that is used increasingly in platform stabilization, motion simulation, inspection and research. Hexapods can also be used to realize vibration isolation in multiple axes. Product models are distinguished by their actuation, sensing, control system, payload capacity, range, resolution, and bandwidth. Precision positioning, vibration isolation, and motion simulation are the three primary design drivers.

HX-P200 pointing system

CSA Hexapod Features

- Actuators and sensors that are optimized for the application
- Strut geometry and mechanical interface customizable per application
- Real time controller with 2 kHz sampling rate
  - Web browser graphical user interface
  - Standard libraries for multi-axis control
  - Calculates kinematics in real time
  - XML-RPC communication between host and target for simple system integration
  - Real time data logging
  - Options for automated operation and acceptance of remote commands
- Completely passive units for vibration isolation
- Options for vacuum compatibility

HX-M300 motion simulator



HexOS hexapod user interface

Standard and Custom Systems

Most of CSA's standard hexapods are for small payloads, but we have delivered systems ranging in size from 130 mm to 3 m, with load capacities between 0.5 and 1500 kg. CSA also builds octopods for specific applications. The table on the following page summarizes specifications of selected hexapod units.

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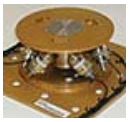
MODEL	HX-M300	HX-M350	HX-P050	HX-P200	HX-P300	HX-V100	HX-V200
							
Purpose	Motion Simulation	Motion Simulation	Pointing	Pointing	Pointing	Isolation	Isolation
Payload Mass	Up to 80 kg	Up to 200 kg	Up to 2.5 kg	Up to 2.5 kg	10-1000 kg	2-20 kg	1-10 kg
Height	330 mm	330 mm	200 mm	115 mm	300-800 mm	200 mm	98 mm
Diameter	564 mm	914 mm	280 mm	195 mm	750-3000 mm	215 mm	203 mm
Range							
x	±15 mm	±25 mm	±19 mm	±22 mm	±10-100 µm	±30 µm	NA
y	±15 mm	±30 mm	±20 mm	±22 mm	±10-100 µm	±30 µm	NA
z	±12 mm	±11 mm	±6.5 mm	±12.5 mm	±10-60 µm	±20 µm	NA
theta x	±5 deg	±2.5 deg	±2.4 deg	±12 deg	±0.1-15 rad	±0.001 rad	NA
theta y	±5 deg	±2.5 deg	±2.4 deg	±12 deg	±0.1-15 rad	±0.001 rad	NA
theta z	±8 deg	±6.2 deg	±9 deg	±15 deg	±0.1-20 rad	±0.001 rad	NA
Resolution							
x	1 µm	1 µm	20 µm	10 µm	2.5-50 µm	0.1 µm	NA
y	1 µm	1 µm	20 µm	10 µm	2.5-50 µm	0.1 µm	NA
z	0.5 µm	0.5 µm	2 µm	1 µm	2.5-25 µm	0.1 µm	NA
theta x	10 µrad	2 µrad	100 µrad	40 µrad	2.5-100 µrad	10 µrad	NA
theta y	10 µrad	2 µrad	100 µrad	40 µrad	2.5-100 µrad	10 µrad	NA
theta z	20 µrad	5 µrad	300 µrad	200 µrad	2.5-150 µrad	10 µrad	NA
Bandwidth	150 Hz	200 Hz	<1 Hz	<1 Hz	0.1-10 Hz	250 Hz	200 Hz
Suspension freqs.	NA	NA	> 70 Hz	> 50 Hz	> 30 Hz	30-90 Hz	20-60 Hz
Test payload mass	3 kg	16	0.5 kg	0.4 kg	20-1200 kg	2 kg	2.5 kg
Power							
Standby	200 W	200 W	30 W	75 W	5-200 W	40 W	75 W
Peak	1.5 kW	1.5 kW	90 W	120 W	75-1250 W	60 W	125 W
Actuation	EM	FM	PZ	PZ	MS	PZ	EM
Control System	Hex OS	Hex OS	user supp.	C6x DSP	PC/DSP	C3x DSP	C6x DSP
User Interface	Type 1	Type 1	none	Type 1	Type 2	cmd line	Type 1

PZ- piezoelectric, EM- electromagnetic, MS- motor-driven screw, Type 1- basic graphical UI, Type 2- enhanced graphical UI

For additional information, please visit www.csaengineering.com/hexapods.shtml, or email *hexapods@csaengineering.com.*