

Hardware-in-The Loop Flight Motion Simulator

Three-Axis Flight Motion Simulator AC3361-450



Description

The Model AC3361-450 Flight Motion Simulator (FMS) is a high dynamic, precision test instrument. The high dynamic motion is made possible by using large, water-cooled electric actuators in all axes. The system is designed to simulate both vibration and precise slow motion while maintaining high pointing accuracy.

The Three Axis Motion Simulator is configured with a horizontal outer (pitch) axis, a middle (yaw) axis, which is orthogonal to the outer axis and an inner (roll) axis supported by the middle axis gimbal. The inner axis table top is the payload mounting area.

All axes have continuous rotational freedom. Sliprings connect the power and signals circuits from the UUT to the table base. Signal lines have four brush contacts per ring to avoid micro interruptions, which could corrupt digital signals. A wide variety of slipring capsule designs and wiring schematics are optional available. A hard-anodized aluminum tabletop on the roll axis serves as the payload mounting surface.

The system design has been optimized for precision pointing with angular vibration. This mode of testing requires power, that results in heating of the motors. Jacketed motor housings permit the addition of water cooling to extend the time for testing under high dynamic conditions. All three axes are optionally water cooled. Protective coatings are

used to prevent corrosion and outer surfaces are painted.

The advanced digital controller model ACUTROL[®]3000 controls the table. The digital controller has a touch sensitive operator interface and scalable analog inputs and outputs. Programmable event pulses can be used for calibration and synchronization with external computers or test equipment. Typically, the standard non real time digital interfaces, IEEE-488 (GPIB) and Ethernet (TCP/IP) are supplemented with SCRAMNet or VMIC real time reflective memory interfaces.

Modes of Operation

- Rate – absolute and relative 0.00001°/sec resolution
- Position absolute with 0.00001 deg resolution
- Track Mode – for real time simulation of motion profiles
- Synthesis Mode – Sinusoidal motion, command amplitude and frequency
- Local or remote control via touch sensitive operator panel or digital interface
- Analog readout and command with 16 bit resolution

Dimensions

Unit Under Test (UUT)

Table Top	650 mm dia, Aluminium
Payload mass for test	50 kg
Payload inertia for test	1.0 kgm ² Roll, 1.2kgm ² Pitch and Yaw
Payload mass maximum	100 kg
Dimensions of test payload	410 mm dia. x 203 mm high
Table Top offset to axis intersection	0 mm
Sliprings (standard)	60 x 2 Amp 10 x 20 Amp 2 x MIL 1553

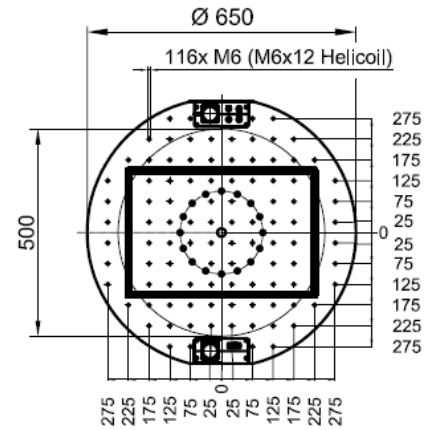


Table Top Detail

Simulator

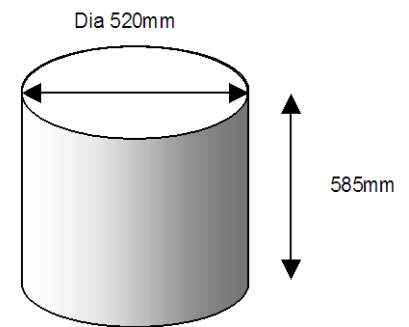
Width x Height x Depth	4'338mm x 2'406mm x 1'200mm
Mass	4'500 kg

Power Cabinet

Length x Height x Depth	5'400 mm x 2'200 mm x 600 mm
Mass	2'000 kg

Control Cabinet

Width x Height x Depth	650 mm x 1'940 mm x 800 mm
Mass	185 kg



Maximum Payload Envelope

Specifications	Roll, inner axis	Yaw, middle axis	Pitch, outer axis
Mechanical			
Orthogonality	3 arc sec		3 arc sec
Wobble	2 arc sec	3 arc sec	3 secs
Dynamic Parameters			
Angular Freedom	continuous	continuous	continuous
Positioning Accuracy	1 arc sec RSS	2 arc sec RSS	2 arc sec RSS
Position Resolution (command)	0.00001 deg	0.00001 deg	0.00001 deg
Rate Range	+/- 1000 deg/sec	300 deg/sec	300 deg/sec
Rate Resolution (command)	0.00001 deg/sec	0.00001 deg/sec	0.00001 deg/sec
Rate Stability	over 1° period over 36° period Over 360° period	0.05% 0.005% 0.0001%	0.05% 0.005% 0.0001%
Acceleration, with load (50kg)	18'000 deg/sec ²	13'000 deg/sec ²	5'000 deg/sec ²
Bandwidth small signal (-3dB or-90deg)	> 50 Hz	> 30 Hz	> 30 Hz
Large signal bandwidth Peak torque for 10 mins* All axes simultaneously without water cooling	10 Hz 1 deg P to P Phase lag <10 deg	10 Hz 1 deg P to P Phase lag < 10 deg	10 Hz 1 deg P to P Phase lag < 25 deg
* Test payload installed, axes balanced and rate modulated			
Options	<ul style="list-style-type: none"> Digital interface options in addition to the standard IEEE-488 and Ethernet are; SCRAMNet, or VMIC Non standard sliprings Special UUT adapters 		

Facility Requirement

Electric Power: 3 phase and ground, 380VAC, 50-60Hz, 250Amps per phase
 Optional Water Cooling 150 Liters/ min for simultaneous motion of all three axes.

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