ACUTRONIC

Two-Axis Motion Simulator 22-Series
Inertial Guidance Test and Calibration System

The 22 Series Motion Simulators are a range of two-axis position and rate tables for the development, manufacturing, testing and calibration of inertial sensors and systems.

They are particularly suited for the testing of tactical grade and high precision navigation sensors including Inertial Measurement Units (IMU) and Inertial Navigation Systems (INS). The high precision position accuracy and rate stability makes them ideal for inertial test requirements in all civilian and military applications.

Features

Single family range with various configuration options depending on customer test requirements

Two-axis unlimited rotation equipped with direct drive brushless motors and position transducers

Choice of several standard slip-ring capsules

Controlled by the industry standard ACUTROL 3000e real-time digital controller

Temperature chamber options:
- Cooling by Liquid Nitrogen LN2 (TCN) or
- Cooling by Carbon Dioxide CO2 (TCC) or
- Cooling by a water or air-cooled free-standing electromechanical refrigeration system (TCM)

Optional electrical expansion valve to provide a very smooth and linear slope in comparison with the solenoid valve.

Benefits

Single solution for all testing including development, integration, production, calibration and maintenance

Large Table Top for testing multiple UUT's up to 890 mm

Excellent precision and absolute positioning

Excellent rate stability

Large user community of thousands of IGTS systems and ACUTROL® digital motion controllers

Characteristics may be adapted to fit customer requirements with customized options of motors, slip-rings and table tops

AC2247-TC	AC2267-TC

Unit Under Test (UUT) Mechanical Interface

	AC2247-TC	AC2267-TC
Load Capacity nominal/maximal/option	20 kg/ 30 kg/ 40 kg*	40 kg/ 60 kg/ 120 kg*
Table Top Diameter, including connectors	450 mm, up to 500 mm	660 mm, up to 740 mm
Hole Pattern	50 mm, grid M6	50 mm grid, M6
Offset to Elevation Axis	0 mm	0 mm

* Heavy payloads may require modifications to counteract sagging effects.

Specifications	Inner Axis	Outer Axis	Inner Axis	Outer Axis
Angular Freedom	continuous		continuous	
Position Accuracy	< 1 arc sec RSS	< 1.5 arc sec RSS	< 1 arc sec RSS	< 1.5 arc sec RSS
Command resolution	0.00001 deg		0.00001 deg	
Repeatability	< 1 arc sec		< 1 arc sec	
Rate Range standard/option	± 1'200 deg/sec	± 600 deg/sec / ± 1,000 deg/sec	± 1'200 deg/sec	± 600 deg/sec / ± 1,000 deg/sec
Stability − over 360 deg	0.0001%	0.0001%		0.0001%
− over 10 deg	0.002%	0.001%		0.001%
− over 1 deg	0.02%	0.01%		0.01%
Command resolution	0.00001 deg/sec		0.00001 deg/sec	
Maximum Acceleration** standard/option	3'000 deg/sec^2	200 deg/sec^2	3'000 deg/sec^2	200 deg/sec^2 / 400 deg/sec^2
Bandwidth** at -3dB	60Hz	20Hz	80 Hz	15 Hz
Mechanical Wobble standard/option	< 2 arc sec/ < 1 arc sec	< 5 arc sec / < 3 arc sec	< 2 arc sec/ < 1 arc sec	< 5 arc sec / < 3 arc sec
Orthogonality standard/option	< 3 arc sec / < 1.5 arc sec		< 3 arc sec / < 1.5 arc sec	
Command and Control	Multi-axis digital motion controller ACUTROL® 3000e			
Communication Interfaces	Ethernet TCP/IP, Real-Time expansion card optional			

** Values are UUT dependent and can be provided upon request if UUT characteristics are available.

Dimensions and Weight

	AC2247-TC	AC2267-TC
Table (L x W x H) incl. rotational clearance	2,205 (up to 2,955) x 1,350 x 1,806 mm	2,470 (up to 3,220) x 1,570 x 1,916 mm
Weight	Up to 1,100 kg	Up to 1,700 kg
Height of Table Top (from floor)	1'130 mm	
Electrical Cabinet (L x W x H), Weight	600 x 820 x 2,200 mm; 320 kg	
Mechanical Cooling Unit	Single-stage unit: 500 kg / Dual-stage unit: 800 kg	Dual-stage unit: 800 kg

Temperature Chamber (TC) with TCM, TCC (CO2) or TCN (LN2) Cooling System

	AC2247-TC	AC2267-TC
Working volume	450 mm diameter and 360 mm height	660 mm diameter and 540 mm height
Temperature Range of TCM	-45 ℃ to +100 ℃ with single-stage air cooled refrigeration or optional water cooled refrigeration*** Option: -55 ℃ to +100 ℃ with dual-stage water cooled refrigeration***	-55 ℃ to +100 ℃ with dual-stage water cooled refrigeration***
Temperature Range of TCC or TCN	-55 / +100 C°	
Thermal Gradients (peak) of TCM	-2 ℃/min (cooling) / +4 ℃/min (heating) according to standard IEC 60068	
Thermal Gradients (peak) of TCC or TCN	-4 ℃/min (cooling) / +4 ℃/min (heating) according to standard IEC 60068	
Stability	± 1 ℃ in working volume	

*** Water cooled refrigeration system requires chiller unit and chiller adaptation kit depending on site installation.

Slipring Standard Options to UUT

Lines	Connectors
52 lines rated 2A, 150VDC	2x37pin D-Sub
28 lines rated 2A, 150VDC +10 lines rated 5A, 150VAC	1x 50pin D-Sub 1x 15pin D-Sub
28 lines rated 2A, 150VDC +4 lines rated 20A, 400VDC	1x 50pin D-Sub 1x 5pin D-Sub (5W5)

Options:
- Customized table top, slipring and connector configurations (dynamic specification subject to change)
- Electromechanical brakes (for "noiseless" bias stability tests)
- Base template w/ or w/o North Alignment kit
- Contactless Ethernet slipring for 1 Gbit/s
- RF (up to 18GHz) rotary joints for GPS signals up to 2 channels
- Fiber optic rotary joints for highest data rates up to 32 channels
- Gas/fluid rotary joints
- E2V electronic expansion valve for TCM dual-stage refrigeration
- Installation support, training, and verification

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	AC2247	AC2267

Unit Under Test (UUT) Mechanical Interface

	AC2247	AC2267
Load Capacity nominal/maximal/option	20 kg/ 30 kg/ 40 kg*	40 kg/ 60 kg/ 120 kg*
Table Top Diameter, including connectors	450 mm, up to 630 mm	660 mm, up to 890 mm
Hole Pattern	50 mm grid M6	50 mm grid M6
Offset to Elevation Axis	87 mm	100 mm

* Heavy payloads may require modifications to counteract sagging effects.

Specifications

Specifications	Inner Axis	Outer Axis	Inner Axis	Outer Axis
Angular Freedom	continuous		continuous	
Position Accuracy	< 1 arc sec RSS	< 1.5 arc sec RSS	< 1 arc sec RSS	< 1.5 arc sec RSS
Command resolution	0.00001 deg		0.00001 deg	
Repeatability	< 1 arc sec		< 1 arc sec	
Rate Range standard/option	± 1'200 deg/sec	± 600 deg/sec / ± 1,000 deg/sec	± 1'200 deg/sec	± 600 deg/sec / ± 1,000 deg/sec
Stability − over 360 deg	0.0001%	0.0001%		0.0001%
− over 10 deg	0.002%	0.001%		0.001%
− over 1 deg	0.02%	0.01%		0.01%
Command resolution	0.00001 deg/sec		0.00001 deg/sec	
Maximum Acceleration** standard/option	3'000 deg/sec^2	250 deg/sec^2	3'000 deg/sec^2	250 deg/sec^2 / 440 deg/sec^2
Bandwidth** at -3dB	60Hz	20Hz	80 Hz	15 Hz
Mechanical Wobble standard/option	< 2 arc sec/ < 1 arc sec	< 5 arc sec / < 3 arc sec	< 2 arc sec/ < 1 arc sec	< 5 arc sec / < 3 arc sec
Orthogonality standard/option	< 3 arc sec / < 1.5 arc sec		< 3 arc sec / < 1.5 arc sec	
Command and Control	Multi-axis digital motion controller ACUTROL® 3000e			
Communication Interfaces	Ethernet TCP/IP, Real-Time expansion card optional			

** Values are UUT dependent and can be provided upon request if UUT characteristics are available.

Dimensions and Weight

	AC2247	AC2267
Table (L x W x H) incl. rotational clearance	2,205 (up to 2,955) x 1,350 x 1,806 mm	2,470 (up to 3,220) x 1,570 x 1,816 mm
Weight	Up to 1,000 kg	Up to 1'400 kg
Height of Table Top (from floor)	1'043 mm	1'030 mm
Electrical Cabinet (L x W x H); Weight	600 x 820 x 2,200 mm; 320 kg	

Slipring Standard Options

Lines	Connectors
70 lines rated 2A, 150VDC	2x 37pin D-Sub
45 lines rated 2A, 150VDC +10 lines rated 5A, 150VAC	1x 50pin D-Sub 1x 15pin D-Sub
45 lines rated 2A, 150VDC +4 lines rated 20A, 400VDC	1x 50pin D-Sub 1x 5pin D-Sub (5W5)

Options:

- Customized table top, slipring and connector configurations (dynamic specification subject to change)
- Electromechanical brakes (for "noiseless" bias stability tests)
- Base template w/ or w/o North Alignment kit
- Contactless Ethernet slipring for 1 Gbit/s
- RF (up to 18 GHz) rotary joints for GPS signals up to 2 channels
- Fiber optic rotary joints for highest data rates up to 32 channels
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ACUTROL®3000e Controller
Multi Axis Digital Motion Control System

ACUTROL®3000e is an evolution of the ACUTROL®3000 – the leading motion control system for high precision single and multi-axis Inertial Guidance, Electro-Optics Test Systems and Hardware in the Loop (HWIL) simulation platforms.

A modular architecture both improves adaptability to various applications and facilitates obsolescence handling.
The controller is backward compatible with the well-proven and established ACUTROL® Control Language (ACL).

ACUTROL®3000e offers unparalleled flexibility, reliability, versatility and performance.

Flexibility

- Adaptable servo topology, including configurable digital filters, allows customized control strategies

- Configurable events based on limit tests of system variables

- Data Logging and Data Playback at the ACUTROL®3000e frame rate make accurate reproduction of motion profiles possible

- Even without a real-time interface, a customizable freeze pulse can trigger a motion data snapshot

Reliability

- Digital pressure and torque loops reduce motion simulator hardware complexity

- Only one encoder for both position detection and motor commutation improves MTBFs

- Global ACUTROL® user community of over one thousand ACUTROL® systems

Versatility

- An integrated Ethernet router allows for easy integration of simulators with facility networks

- Example code, simulation utilities, and demo kits enable application development before delivery of the actual motion system

- Built-in capability to use a wide range of encoder types, including absolute optical encoders

- Remote control of simulators, including Power On / Off is possible

Performance

- Compensation of deterministic cogging and position errors resulting in high position accuracy and smooth rate performance

- Advanced vector processing algorithms provide asynchronous, multi-rate, real time communication, ensuring high fidelity motion simulation

The specifications identified in this data sheet are representative of standard systems. ACUTRONIC is able to custom design systems to meet customer specific requirements.

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