



## Three-Axis Motion Simulator 33-Series

Inertial Guidance Test and Calibration System



The 33-Series Motion Simulators are a range of three-axis position and rate tables for the development, manufacturing, testing and calibration of inertial sensors and systems, which require movements around three axis.

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. Independent motion simulation in three axes makes them very versatile:

### Features

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

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

Large choice of standard and custom 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.



AC3347-TC

AC3367-TC

Unit Under Test (UUT) Mechanical Interface		
Load Capacity nominal/maximal/option	20 kg/ 30 kg/ 40 kg*	40 kg/ 60 kg/ 100 kg*
Table Top Diameter, including connectors	ø450, up to ø500	ø660, up to ø740
Hole Pattern	50 mm or 2" grid	50 mm or 2" grid
Offset to Elevation Axis	75 mm	0 mm

\* Heavy payloads may require modifications to counteract sagging effects.

Specifications	Inner Axis	Middle Axis	Outer Axis	Inner Axis	Middle Axis	Outer Axis
Angular Freedom		continuous			continuous	
Position Accuracy arc sec RSS	<1	<1.5	<1	<1	<1.5	<1
Command resolution		0.00001 deg			0.00001 deg	
Repeatability		< 1 arc sec			< 1 arc sec	
Rate Range standard/option	1'500 / 2'000	400 / 500	400 / 500	1'500 / 2'000	400 / 500	400 / 500
Stability – over 360 deg		0.0005%			0.0005%	
– over 10 deg		0.005%			0.005%	
– over 1 deg		0.05%			0.05%	
Command resolution		0.00001 deg/sec			0.00001 deg/sec	
Maximum Acceleration** standard/option	4'000 / 8'000	400 / 800	400 / 500	4'000 / 6'000	500 / 800	500 / 800
Bandwidth** at -3dB	80 Hz	15 Hz	15 Hz	80 Hz	15 Hz	15 Hz
Mechanical Wobble standard/option	< 5sec/ < 1sec	< 5sec/ < 3sec	< 5sec/ < 1sec	< 5sec/ < 1sec	< 5sec/ < 3sec	< 5sec/ < 1sec
Orthogonality standard/option		< 3sec/ < 1sec			< 3sec/ < 1sec	
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	
Table (L x W x H) incl. rotational clearance	3'000 mm x 2'350 mm x 2'700 mm
Weight	min. 1'800 kg
Height of Table Top (from floor)	1'280 mm
Electrical Cabinet (L x W x H), Weight	600 x 820 x 2'200 mm; 320 kg
Mechanical Cooling Unit	Dual-stage unit: 800 kg

Temperature Chamber (TC) with TCM, TCC (CO2) or TCN (LN2) Cooling System	
Working volume	ø450 up to 360mm height
	ø660 up to 540mm height
Temperature Range of TCM ***	-55 °C to +100 °C
Temperature Range of TCC or TCN	-55 / +100 °C
Thermal Gradients (peak) of TCM ***	-2 °C/min (cooling) / +4 °C/min (heating) according to standard IEC 60068
Thermal Gradients (peak) of TCC or TCN	-4 °C/min (cooling) / +4 °C/min (heating) according to standard IEC 60068
Stability	± 1 °C

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

Slipping 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, slipping and connector configurations
- Electromechanical brakes (for "noiseless" bias stability tests)
- Contactless Ethernet slipping 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
- E2V electronic expansion valve for TCM dual-stage refrigeration (proportional valve: decreased noise level during operation)



AC3347

AC3367

Unit Under Test (UUT) Mechanical Interface		
Load Capacity nominal/maximal/option	20 kg/ 30 kg/ 40 kg*	40 kg/ 60 kg/ 100 kg*
Table Top Diameter, including connectors	Standard ø450, up to ø650	Standard ø660, up to ø890
Hole Pattern	50 mm or 2" grid	50 mm or 2" grid
Offset to Elevation Axis	150 mm	0 mm

\* Heavy payloads may require modifications to counteract sagging effects.

Specifications	Inner Axis	Middle Axis	Outer Axis	Inner Axis	Middle Axis	Outer Axis
Angular Freedom		continuous			continuous	
Position Accuracy arc sec RSS	<1	<1.5	<1	<1	<1.5	<1
Command resolution		0.00001 deg			0.00001 deg	
Repeatability		< 1 arc sec			< 1 arc sec	
Rate Range standard/option	1'500 / 2'000	400 / 500	400 / 500	1'500 / 2'000	400 / 500	400 / 500
Stability – over 360 deg		0.0005%			0.0005%	
– over 10 deg		0.005%			0.005%	
– over 1 deg		0.05%			0.05%	
Command resolution		0.00001 deg/sec			0.00001 deg/sec	
Maximum Acceleration** standard/option	4'000 / 8'000	400 / 800	400 / 500	4'000 / 6'000	500 / 800	500 / 800
Bandwidth** at -3dB	80 Hz	15 Hz	15 Hz	80 Hz	15 Hz	15 Hz
Mechanical Wobble standard/option	< 5sec/ < 1sec	< 5sec/ < 3sec	< 5sec/ < 1sec	< 5sec/ < 1sec	< 5sec/ < 3sec	< 5sec/ < 1sec
Orthogonality standard/option		< 3sec/ < 1sec			< 3sec/ < 1sec	
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		
Table (L x W x H) incl. rotational clearance	2'050 mm x 2'050 mm x 2'000 mm	2'600 mm x 2'600 mm x 2'600 mm
Weight	min. 1'400 kg	min. 2'900 kg
Height of Table Top (from floor)	1'190 mm	1'550 mm
Electrical Cabinet (L x W x H); Weight	600 x 820 x 2'200 mm; 320 kg	

Slipping Standard Options	
Lines	Connectors
70 lines rated 2A, 150VDC	2x37pin 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, slipping and connector configurations (dynamic specification subject to change)
- Electromechanical brakes (for "noiseless" bias stability tests)
- Contactless Ethernet slipping 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
- Gas/fluid rotary joints
- Installation support, training, and verification



AC3327

AC3327-TC

Unit Under Test (UUT) Mechanical Interface		
Load Capacity nominal/maximal/option	5 kg/ 10 kg/ 15 kg*	5 kg/ 10 kg/ 15 kg*
Table Top Diameter, including connectors	Standard ø300, up to ø450	ø300
Hole Pattern	Standard 50mm or 2" grid	Standard 50mm or 2" grid, Optional 25mm or 1"
Offset to Elevation Axis	90 mm	25 mm

\* Heavy payloads may require modifications to counteract sagging effects.

Specifications	Inner Axis	Middle Axis	Outer Axis	Inner Axis	Middle Axis	Outer Axis
Angular Freedom		continuous			continuous	
Position Accuracy arc sec RSS	<1	<1.5	<1	<1	<1.5	<1
Command resolution		0.00001 deg			0.00001 deg	
Repeatability		< 1 arc sec			< 1 arc sec	
Rate Range standard/option	1'500 / 2'000	400 / 500	400 / 500	1'500 / 2'000	400 / 500	400 / 500
Stability – over 360 deg		0.0005%			0.0005%	
– over 10 deg		0.005%			0.005%	
– over 1 deg		0.05%			0.05%	
Command resolution		0.00001 deg/sec			0.00001 deg/sec	
Maximum Acceleration** standard/option	10'000 / 20'000	300 / 1'000	300 / 400	10'000 / 20'000	300 / 1'000	300 / 400
Bandwidth** at -3dB	80 Hz	15 Hz	15 Hz	80 Hz	15 Hz	15 Hz
Mechanical Wobble standard/option	< 5sec/ < 1sec	< 5sec/ < 3sec	< 5sec/ < 1sec	< 5sec/ < 1sec	< 5sec/ < 3sec	< 5sec/ < 1sec
Orthogonality standard/option		< 3sec/ < 1sec			< 3sec/ < 1sec	
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		
Table (L x W x H) incl. rotational clearance	1'700 mm x 1'700 mm x 2'100 mm	2'800 mm x 2'300 mm x 2'850 mm
Weight	min. 700 kg	min. 950 kg
Height of Table Top (from floor)	1'575 mm	1'515 mm
Electrical Cabinet (L x W x H), Weight	600 x 820 x 2'200 mm; 320 kg	

Temperature Chamber (TC), TCC (CO2) or TCN (LN2) Cooling System	
Working volume	ø300 up to 240mm height
Temperature Range of TCC or TCN	-55 / +100 °C
Thermal Gradients (peak) of TCC or TCN	-4 °C/min / +2 °C/min according to standard IEC 60068
Stability	± 1 °C

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
- Electromechanical brakes (for "noiseless" bias stability tests)
- 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