

Hip Wear Simulator

Efficient and accurate ISO

14242 tests

The Shore Western Hip Simulator was developed under direction of medical device manufacturers and orthopedic academics to simulate the complex kinematics and kinetics of the human hip in a physiological environment. Running in accordance with ISO 14242-3 axial load control, an array of hip complexities can be studied by researchers and designers looking to extensively analyze the mechanical properties and materials tribology of their prosthetic hip designs.



A typical hip simulator has four stations with three channels per station. Each channel has the ability to run an independent load profile under closed-loop control up to 1.5Hz. Axial loads can be applied up to 4500N (1000lbs) on each channel combined while collecting axial torque data. Flexion/Extension and Adduction/Abduction translations are programmed using a 23° biaxial rocking motion common to all channels.

Acetabular cup orientation can be studied with either anatomically correct or inverted (cup on bottom) configurations, using components with a bearing diameter of up to 66mm and a maximum test chamber volume of 1000ml (for water, saline or bovine/alpha calf serum), allowing the researcher greater flexibility in their study matrix.

Metallic surfaces within the test chamber prone to contact with testing lubricant are thin-film plastic-coated to prevent ion interaction between the test chamber and the bearing components and its debris, making collection of spent serum for wear debris or metal ion

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analysis straightforward without the risk of cross-contamination between test chambers.

Individual peristaltic pumps are available for each channel with level and temperature interlocks in each serum storage reservoir; lubricant temperature can be set and maintained via the heater/chiller unit. Each station of test chambers is enclosed within ergonomic Lexan hoods maintaining a clean test environment and maintaining user safety. Available loaded-soak stations (without hip kinematics) can accept three or six daisy-chained specimens on each load channel for a total of twelve specimens. Each channel includes independent control with closed- loop axial load feedback.

Shore Western Hip Simulators can also be built to accommodate ISO 14242-1, allowing independent closed-loop angular displacement of Flexion/Extension, Adduction/Abduction and Internal/External rotations.

Shore Western can also supply our industry acclaimed Whisperpak® hydraulic pump to complement the system. These pumps provide clean, full flow, conditioned oil at 210bar (3000psi) with less than 70dB of noise.

Control System

The Hip Wear control system is based on the Shore Western SC6000 platform, running in a Windows® 7 environment. The application software is specifically designed to run ISO 14242 tests. Our proprietary Real Time Active Control (RTAC) algorithm through mixed-mode control is able to learn the system behavior and adapt to control the non-linear response, matching the desired waveform. The user enters their desired curve for load. Error boxes can be entered for the turning points. Should the response signal fall outside these limits, the system can be stopped, allowing early detection of damage to the specimen.



Features

- Up to 12 specimens that are arranged in four groups of three.
- Up to 12 axial load (Fz) channels and one common DC motor
- Axial load (Fz) capacity of up to 4500N (1000lbs) per channel with independent programmability.
- One load cell per specimen
- Biaxial rocking motion for Flexion/Extension and Adduction/Abduction for up to 23°
- Anatomic or Inverted cup orientation
- Speeds up to to 1.5Hz
- Components can be up to 66mm in bearing diameter
- Serum test chamber can accommodate up to 1000ml of testing lubricant
- Easy access with separate Lexan hoods for each specimen
- Compact footprint, approximately 1994mm (78.5in) long x 533mm (21in) wide x 1473mm (58in) high
- 24/7 operation is possible with sophisticated specimen failure detection, and reliable uptime.

Options

- Individual peristaltic pump for each channel with a temperature interlock in each serum test chamber. Lubricant temperature can be set and maintained using a heater/chiller unit.
- Loaded soak stations (without hip kinematics). Two options are available: modular loaded-soak station on one end of
 the hip simulator (pictured above) accepting up to three daisy-chained specimens on each load channel for a total of
 twelve specimens; or an individual soak load frame with each station accepting up to six daisy-chained specimens on
 each load channel for a total of twelve specimens. Each station includes independent control with load feedback.
 Cyclic loads are synchronized with each wear test station, and can be discretely isolated and adjusted. The individual
 loaded soak frame can accommodate both knee and hip components for more flexibility.
- Calibration fixtures. A single axis calibration cell is used to calibrate the Fz load to full scale.