

HIP · ELECTROMECHANICAL SIMULATOR

Hip Wear Simulator.

A multi station machine designed for the reliable and repeatable testing of both hip and spinal implants. Developed with a leading independent wear testing house.

ISO 14242-1 · ISO 14242-4 · ASTM F2582 · ASTM F3047-15

6

HIP OR SPINAL IMPLANTS
TESTED SIMULTANEOUSLY

5 kN

MAXIMUM AXIAL LOADING PER
STATION

±60°

FLEXION EXTENSION RANGE OF
MOTION



WEAR SIMULATION

Total hip replacement — simulated in-vivo wear

— ABOUT PROSIM

A research partnership turned *global product range*.

ProSim, a division of Simulation Solutions Group, designs and manufactures advanced electromechanical wear and fatigue simulators for orthopaedic implant testing, in long standing partnership with the University of Leeds.

Since the 1990s, ProSim, a division of the Simulation Solutions Group, has been at the forefront of orthopaedic implant wear testing through a long standing partnership with the University of Leeds. Together, we have developed advanced wear and fatigue simulators with over 100 stations of testing capacity across leading global orthopaedic manufacturers and testing houses.

Today, ProSim offers a comprehensive suite of electromechanical simulators for both medical and industrial tribological and wear fatigue testing. Our flexible, cost effective approach has enabled

us to expand into both mature and emerging global markets.

We work closely with customers and academic partners to design simulators that exceed appropriate standards, replicating real world conditions, wider ranges of motion, and higher loads to better understand adverse wear. At the heart of ProSim is a 30 year legacy of innovation, trusted collaboration, and a relentless drive to push the boundaries of fatigue research.

Through participation in major European research initiatives like the Lifelong Joints Project, ProSim has consistently pushed the boundaries of implant wear research.

OVERVIEW

Hip Wear Simulator.

The ProSim Hip Wear Simulator was designed and developed in response to the growing demand for ever more aggressive adverse testing of hip implants. Working together with a leading independent wear testing house, the simulator was developed with a number of key objectives in mind: fully meet ISO 14242-1 and ISO 14242-4; go well beyond existing ISO requirements for adverse wear testing; strictly follow anatomical loading applied through the acetabular cup; strictly follow anatomical movement applied through the femoral head; and deliver precise, accurate and repeatable microseparation.

All axes of the ProSim Hip Wear Simulator are electromechanically driven, using a combination of motors, drives and gearboxes. This enables the simulator to closely follow any demand waveform however demanding it may be.

The Peltier Heater/Cooler system automatically maintains the test fluid media (serum) temperature at $37^{\circ}\text{C} \pm 2^{\circ}\text{C}$, replacing the previous heater and pump system that circulated serum externally. As a result only 1/3 of the serum volume is required versus the pump + heater system.

Empirical data generated by our simulators over the last fifteen years supports the assertion that the patterns of wear of hip implants tested in the ProSim Hip Wear Simulator accurately mirror those of implants extracted from humans after years of use.

AT A GLANCE**STANDARDS****ISO 14242-1 / -4****HIP OR SPINAL IMPLANTS TESTED
SIMULTANEOUSLY****6****MAXIMUM AXIAL LOADING PER
STATION****5 kN****FLEXION EXTENSION RANGE OF
MOTION** **$\pm 60^{\circ}$** **DRIVE****Electromechanical**

— FEATURES

Features *and benefits.*

Every capability published for the Hip Wear Simulator, sourced from the ProSim product page and product documentation.

- Up to six hip or spinal implants tested simultaneously
- Up to two hip or spinal implants load soaked
- Axial loading up to 5 kN per station
- Flexion extension range $\pm 60^\circ$
- Abduction adduction range $\pm 20^\circ$
- Interior exterior rotation range $\pm 30^\circ$
- Both force and displacement control
- Microseparation displacement of the acetabular cup up to 5 mm
- Operating frequency programmable up to 2.0 Hz
- Six axis load cell on every station
- XY table on every station for centre of rotation alignment
- Dedicated heater per station maintains serum at $37^\circ\text{C} \pm 2^\circ\text{C}$
- 4/5 electromechanically driven axes with independent axial loading
- Strictly follows anatomical loading and movement
- Precise, accurate and repeatable edge loading (microseparation) and impingement test
- Peltier sealed temperature controlled test cells that reduce serum usage by up to 50%
- Programmable sequences of walking, jogging and rest periods
- Real time logging of position and load
- Clinically and physiologically representative testing
- Up to 50 programmable profiles
- Backed by ProSim service & support, install, training, follow-up, PM, remote support

— SPECIFICATION

Technical *specification.*

Complete machine specification for the Hip Wear Simulator.

PARAMETER	VALUE
Test stations (kinematic)	Up to 6 stations
Test stations (load soak)	Up to 2 stations
Axial load (per station)	Up to 5 kN
Flexion Extension	±60°
Abduction Adduction	±20°
Interior Exterior rotation	±30°
Microseparation displacement	Up to 5 mm (acetabular cup)
Operating frequency	Up to 2.0 Hz
Activity profiles	Up to 50 programmable profiles
Control modes	Force & displacement
Load cell	Six axis, per station
Alignment	XY table per station
Temperature control	37°C ±2°C Peltier heater/cooler
Drive	Electromechanical (motors, drives, gearboxes)
Standards	ISO 14242-1; ISO 14242-4; ASTM F2582; ASTM F3047-15

Specification is indicative, exact configuration is confirmed at quotation. ProSim is able to offer customisation of its simulators to meet a client's specific testing requirements.

APPLICATIONS

Applications.

Common use cases for the Hip Wear Simulator.

01

Hip implant pre clinical wear

Wear evaluation to ISO 14242-1 across bearing types.

02

Impingement / adverse wear

Testing under variations in component positioning per ASTM F2582 / F3047-15.

03

Microseparation studies

Up to 5 mm acetabular cup displacement, precise, accurate, repeatable. ISO 14242-4.

04

Wider applications

Can also be used for testing lumbar TDR (ISO 18192-1) and shoulder implants to new ISO standards.

CUSTOMISATION

ProSim is able to offer customisation of its simulators to meet a client's specific testing requirements. We are always happy to look at the customisation of existing equipment or design and build projects to a customer's specifications.

— HIP · ISO 14242-1 / -4

Arrange a *consultation.*

If you have any specific requirements not fully addressed here, please get in touch. ProSim is always happy to discuss customisation of existing equipment or design and build projects.

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