

ELECTRO MECHANICAL WEAR & FATIGUE SIMULATORS · SINCE 1993

Simulate to evaluate. *Improving longevity.*

A complete reference to the ProSim range of electro mechanical orthopaedic implant testing simulators, engineered in Manchester, United Kingdom in long standing partnership with the University of Leeds.

ISO 14242-1

ISO 14242-4

ISO 14243-1

ISO 14243-3

ISO 18192-1

ASTM F732

RANGE

Five medical simulators across
joint & tribology testing

HERITAGE

Since 1993, a division of
Simulation Solutions Group

STANDARDS

ISO 14242 · 14243 · 18192
+ ASTM F732 · ISO 7206-6

— HELLO, WE ARE PROSIM

A 30 year legacy of *innovation and collaboration.*

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 electro mechanical 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.

The ProSim team

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01 / About ProSim

Global leader in *orthopaedic wear testing* technology since the early 1990s.

ProSim developed some of the world's first mechanical wear and fatigue simulators for orthopaedic implants. Today, the relationships established over three decades provide over 100 stations of testing capacity across leading global orthopaedic manufacturers and testing houses.

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

Today, Simulation Solutions offers a complete suite of electro mechanical tribological and wear simulators for both medical and industrial fatigue testing. In addition to major joint implants, our systems also support testing of ankles, shoulders, elbows, fingers and cadaveric specimens. We regularly co develop custom simulators with researchers and clinical partners, supporting both standards based testing and exploratory studies.

Our simulators go beyond ISO standards, capable of simulating complex real world conditions, multiple loading profiles, and adverse wear scenarios. With over 25 years of innovation and a strong commitment to advancing medical and industrial fatigue testing, ProSim continues to lead the way in delivering high performance, customisable solutions to research teams across the world.

Since 1993.

Founded through the University of Leeds collaboration.

100+

Stations of testing capacity across leading global orthopaedic manufacturers and testing houses.

25 yrs+

Empirical data supporting our wear pattern fidelity to retrieved implants.

01.2 / Range

The ProSim *medical simulator range.*

Five medical simulators, each designed against the appropriate ISO or ASTM standard, and built to go beyond it.

HIP · 02.1

Hip Wear Simulator

06

ISO 14242-1 · ISO 14242-4

Multi station electromechanical simulator for hip and spinal implants. Six implants tested simultaneously plus two load soaked.

6 stations 5KN axial ±60° FE

KNEE · 02.2

Knee Wear Simulator

07

ISO 14243-1 · ISO 14243-3

Developed with one of the leading US knee implant manufacturers. Independent stations, each runs its own demand waveform. Deep knee bending and soft tissue virtual springs.

INDEP. stations 5KN axial ±90° FE

SPINE · 02.3

Spine Wear Simulator

08

ISO 18192-1 · ISO 18192-3

Cervical and lumbar TDR testing. Fully independent axial loading per station, essential given the 10× cervical/lumbar load difference.

3+2 stations 5KN axial 50 profiles

UNIVERSAL · 02.4

Universal Joint Simulator

09

MULTI JOINT PLATFORM

Flexible platform supporting orthopaedic testing across multiple joint types. Contact ProSim for full specification.

MULTI JOINT CUSTOM

TRIBOLOGY · 02.5

Pin-On-Plate Tribometer

10

ASTM F732-00 (2011)

Multi station machine for the reliable and repeatable study of tribometer material wear. 57 mm Ø counterface, Peltier 37°C ±2°C.

MULTI STN. 2HZ Ra=0.4µM 37°C ±2°C

HIP · 02.1

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, fully meeting ISO 14242-1, ISO 14242-4, ASTM F2582 and ASTM F3047-15.

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

KEY FEATURES

- Up to six hip or spinal implants tested simultaneously; up to two load soaked
- 4/5 electromechanically driven axes with independent controlled axial loading
- Axial loading up to 5 kN per station, frequency programmable up to 2.0 Hz
- FE $\pm 60^\circ$, AA $\pm 20^\circ$, IE rotation $\pm 30^\circ$; six axis load cell per station
- Precise, accurate and repeatable microseparation, up to 5 mm acetabular cup displacement
- Peltier sealed temperature controlled test cells that reduce serum usage by up to 50%
- Goes well beyond existing ISO requirements for adverse wear testing
- Up to 50 programmable profiles

HEADLINE SPECIFICATION

Stations	6 + 2 load soak
Axial load	Up to 5 kN
FE / AA / IE	$\pm 60^\circ$ / $\pm 20^\circ$ / $\pm 30^\circ$
Microseparation	Up to 5 mm
Frequency	Up to 2.0 Hz
Temperature	37°C $\pm 2^\circ$ C Peltier
Standards	ISO 14242-1 / -4

KNEE · 02.2

Knee Wear Simulator

The mobility of the knee joint presents significant problems for effective and rigorous in vivo testing. Working with one of the leading US knee implant manufacturers, the ProSim Knee Wear Simulator (Independent Stations) was designed to give full force and displacement control on individual stations, enabling each to run autonomously.

ISO 14243-1 · ISO 14243-3

KEY FEATURES

- Up to six knee implants tested simultaneously; load soak incorporated into each station
- Three articulation axes plus two translational axes per station; six axis load cell per station
- Each station fully independent, capable of running its own demand waveforms
- Fully meets ISO 14243-1 and ISO 14243-3
- Auto adapting force control to meet ISO 14243-1 draft 2024
- Up to 50 programmable profiles
- Capable of replicating deep knee bending; incorporates soft tissue virtual springs
- $\pm 90^\circ$ FE; $\pm 30^\circ$ tibial rotation; ± 25 mm AP translation; $\pm 10^\circ$ AA; ± 10 mm M L
- Up to 5 kN axial load per station; frequency up to 2.0 Hz
- Peltier sealed temperature controlled test cells that reduce serum usage by up to 50%

HEADLINE SPECIFICATION

Stations	Up to 6, independent
Axial load	Up to 5 kN per station
FE / Tibial rot.	$\pm 90^\circ$ / $\pm 30^\circ$
AP / M L	± 15 mm / ± 10 mm
Control	Force & displacement
Frequency	Up to 2.0 Hz
Standards	ISO 14243-1 / -3

SPINE · 02.3

Spine Wear Simulator

The design of a spine simulator able to accurately test both cervical and lumbar total intervertebral disc replacements (TDRs) presents significant challenges, as the two TDRs are exposed to very different axial loads, by more than a factor of 10. The ProSim Spine Wear Simulator addresses this by design.

ISO 18192-1 · ISO 18192-3

KEY FEATURES

- Up to three TDR implants kinematically tested; up to two load soaked
- Each station with fully independent axial loading
- Both cervical and lumbar TDRs accurately tested to ISO 18192-1 and ISO 18192-3
- Axial load plus three axes of articulation (FE, LB, AR) per kinematic station
- Up to 50 programmable profiles; up to 2.0 Hz operating frequency
- Axial loading up to 2 kN per station
- $\pm 10^\circ$ FE / LB / AR
- Test fluid maintained at $37^\circ\text{C} \pm 2^\circ\text{C}$ via Peltier heater/cooler
- Capable of replicating activities of daily living

HEADLINE SPECIFICATION

Stations	3 kinematic + 2 soak
Axial load (per stn.)	Up to 5 kN
FE / LB / AR	$\pm 10^\circ$ each ($\pm 0.5^\circ$)
Profiles	Up to 50
Frequency	0.5 to 2.0 Hz
Temperature	$37^\circ\text{C} \pm 2^\circ\text{C}$ Peltier
Standard	ISO 18192-1 · ISO 18192-3

UNIVERSAL · 02.4

Universal Joint Simulator

A flexible platform supporting ProSim's wider testing capability, in addition to major joint implants, ProSim's systems support testing of ankles, shoulders, elbows, fingers and cadaveric specimens. Custom configurations co developed with researchers and clinical partners.

Multi joint platform · Custom configurations supported

CAPABILITY

- Supports testing of major joint implants alongside ankles, shoulders, elbows and fingers
- Supports testing of cadaveric specimens
- Co developed with researchers and clinical partners as bespoke configurations
- Builds on the same electro mechanical principle as the wider ProSim range
- Designed to support both standards based testing and exploratory studies
- Up to 50 programmable profiles

SPECIFICATION

Platform	Multi joint testing
Joints supported	Hip · Knee · Ankle · Shoulder · Elbow · Finger
Specimens	Implants & cadaveric
Configuration	Bespoke per customer brief
Specification	Per prosim.co.uk , contact ProSim for full specification

TRIBOLOGY · 02.5

Pin-On-Plate Tribometer

A multi station machine designed for the reliable and repeatable study of tribometer material wear, meeting the apparatus requirements of ASTM F732-00 (2011) for wear testing of polymeric materials used in total joint prostheses.

ASTM F732-00 (2011)

KEY FEATURES

- Multi station machine for repeatable tribometer material wear study
- Frequency of motion programmable up to 2 Hz
- Up to 50 programmable profiles
- Counterface fitted in sample cup with lubricant level sensor
- Nominal counterface, 57 mm Ø × 3 mm; 316 grade stainless steel polished to Ra = 0.4 µm as standard
- Integrated heater + temperature control maintains lubricant at 37°C ±2°C
- Counterface alignment feature, removable for examination, refitted in same orientation
- Station specific valve top up system maintains lubricant levels

HEADLINE SPECIFICATION

Configuration	Multi station
Frequency	Up to 2 Hz
Counterface	57 mm Ø × 3 mm
Material (std.)	316 stainless, Ra = 0.4 µm
Temperature	37°C ±2°C
Lubricant	Per station top up
Standard	ASTM F732-00 (2011)

03 / Going beyond ISO

Designed to *exceed* appropriate standards.

ProSim simulators are designed to go beyond ISO requirements where the application demands it, wider ranges of motion, higher loads, and adverse wear scenarios that mirror real world clinical conditions.

Adverse wear testing

Each simulator in the ProSim range is capable of going well beyond existing ISO requirements for adverse wear testing, wider ranges of motion, higher loads, longer cycle counts.

Wider testing capability

In addition to major joint implants, ProSim's systems also support testing of ankles, shoulders, elbows, fingers, and cadaveric specimens.

Empirical validation

Empirical data generated by ProSim's range of simulators over the last 25 years supports the assertion that the wear patterns of implants tested in our simulators accurately mirror that of the wear of implants extracted from humans after years of use.

Co developed with researchers

Working closely with customers and academic partners, ProSim designs simulators that exceed appropriate standards, replicating real world conditions, wider ranges of motion, and higher loads to better understand adverse wear.

"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."

PROSIM.CO.UK · HOMEPAGE

03.2 / Custom

Customisation and *design and build.*

ProSim is able to offer customisation of its simulators to meet a client's specific testing requirements. If you have specific requirements not addressed by the standard range, the engineering team is always happy to look at the customisation of existing equipment or design and build projects to a customer's specification.

Examples of customisation

- Additional stations or different configurations (e.g. single bank of six stations, two banks of three)
- Custom fixturing for specific implant geometries or research protocols
- Testing of joints beyond the standard range, ankles, shoulders, elbows, fingers
- Cadaveric specimen testing setups
- Bespoke design and build projects to customer specifications
- Going beyond ISO requirements, wider ranges of motion, higher loads, adverse wear scenarios

Beyond the standard

ProSim simulators are designed to go beyond ISO standards, capable of simulating complex real world conditions, multiple loading profiles, and adverse wear scenarios.

Working closely with customers and academic partners, we design simulators that exceed appropriate standards, replicating real world conditions, wider ranges of motion, and higher loads to better understand adverse wear.

"Empirical data generated by ProSim's range of simulators over the last 25 years supports the assertion that the wear patterns of implants tested in our simulators accurately mirror that of the wear of implants extracted from humans after years of use."

PROSIM.CO.UK · SPINE WEAR
SIMULATOR PRODUCT PAGE

04 / Service

Service and *support.*

From the outset, ProSim has put the customer first. Every simulator is supplied with an extendable warranty package, installation, training, follow up visits, preventative maintenance and remote support.

On site installation & training

Every ProSim simulator is commissioned on site by our engineering team, with operator and maintenance training delivered as part of the installation.

Three month follow up visit

A follow up engineering visit three months after installation, confirming the system is performing as expected and operators are confident using it.

Preventative maintenance

Annual on site preventative maintenance visits as standard. Service contracts can be extended for up to five years from installation.

Remote & telephone support

Remote access support and direct telephone support from the engineering team in Manchester, United Kingdom, where the simulators are designed and built.

Worldwide engineer network

A combination of local engineers (via distributors) and our own staff supports ProSim installations across the world. Engineers on site is an important part of our offering.

Return to base refurbishment

Extends the useful economic life of your ProSim simulator, including replacement of the control system with the latest generation, restoring like new performance.

04.2 / Customers

Trusted *worldwide.*

ProSim simulators are designed for the conducting of both rigorous compliance work and cutting edge research. Our customers range from leading universities to orthopaedic implant manufacturers, government FDAs and independent testing laboratories.

UNITED KINGDOM

Leeds
Nottingham
Birmingham
Cambridge

EUROPE

France
CETIM, France
Sweden
Germany

ASIA & PACIFIC

Japan
Thailand
Korea

INDIA

India

AUSTRALIA

Australia

04.3 / Contact

Arrange a *consultation*.

If you have specific requirements not fully addressed in this brochure, including customisation of existing equipment or design and build projects to a customer's specifications, please get in touch.

Standard products

Choose from the five platform medical simulator range. Lead times and configurations confirmed at quotation.

Custom & bespoke

Design and build to a customer specification, including custom fixturing, additional stations and beyond ISO test envelopes.

Refurbishment

Return to base refurbishment with the latest generation control system to extend the useful economic life of existing simulators.

CONTACT PROSIM

Get in touch.

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A 30 year legacy of innovation, trusted collaboration, and a relentless drive to push the boundaries of fatigue research.

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