

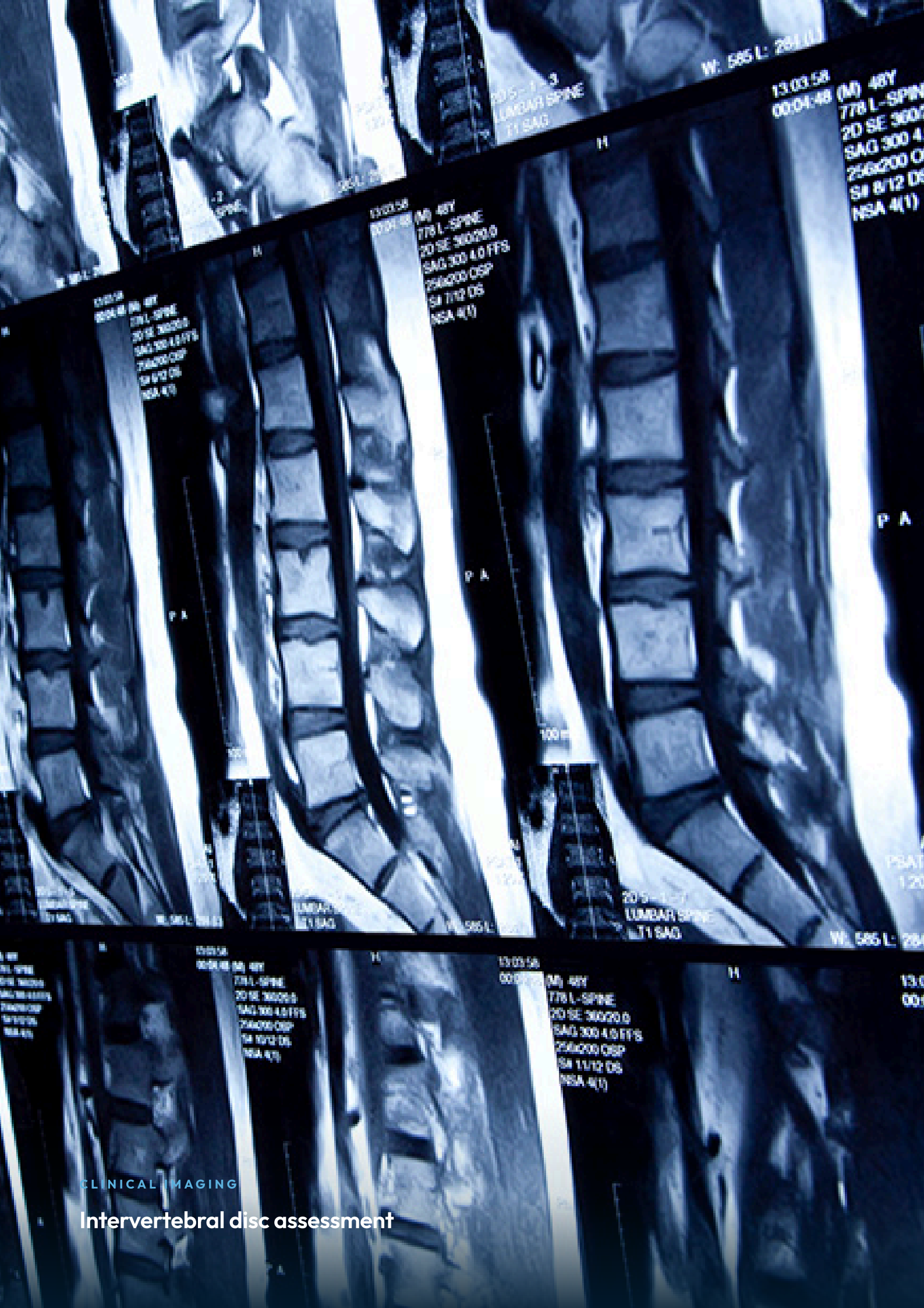
SPINE · ELECTROMECHANICAL SIMULATOR

Spine Wear Simulator.

A multi station machine designed for the reliable and repeatable testing of TDR implants. The two TDRs (cervical and lumbar) are exposed to very different axial loads, by more than a factor of 10.

ISO 18192-1 · ISO 18192-3

3+2KINEMATIC AND LOAD SOAK
TEST STATIONS**5 kN**INDEPENDENT AXIAL LOADING
PER STATION**50**PROGRAMMABLE ACTIVITY
PROFILES



CLINICAL IMAGING

Intervertebral disc assessment

— 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

Spine Wear Simulator.

The design of a spine simulator able to accurately test both cervical and lumbar total intervertebral disc replacements (TDRs hereafter) 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 was designed and developed with the following key objectives: fully meet the requirements of ISO 18192-1 and ISO 18192-3; go well beyond existing ISO requirements for adverse wear testing; each station with fully independent axial loading; capable of replicating activities of daily living.

All controlled axes of the ProSim Spine Wear Simulator are electromechanically driven, using a combination of motors, drives and gearboxes. This enables the simulator to closely follow any loading and displacement demand waveform however demanding it may be. The Peltier Heater/Cooler maintains the test fluid media (serum) at $37^{\circ}\text{C} \pm 2^{\circ}\text{C}$, only 1/3 of the serum volume is required versus the pump + heater system.

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 those of implants extracted from humans after years of use.

AT A GLANCE

STANDARDS
ISO 18192-1

KINEMATIC AND LOAD SOAK TEST STATIONS
3+2

INDEPENDENT AXIAL LOADING PER STATION
5 kN

PROGRAMMABLE ACTIVITY PROFILES
50

DRIVE
Electromechanical

— FEATURES

Features *and benefits.*

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

- Up to three TDR implants kinematically tested simultaneously
- Up to two TDR implants load soak tested simultaneously
- Both cervical and lumbar TDRs to ISO 18192-1
- Each station with fully independent axial loading
- Axial load plus three axes of articulation (FE, LB, AR) per kinematic station
- Axial load only on each soak station
- Up to 50 programmable profiles
- Operating frequency programmable up to 2.0 Hz
- Capable of replicating activities of daily living
- Walking / jogging / running / rest programmable sequences
- Axial loading up to 5 kN per station
- $\pm 10^\circ$ FE motion
- $\pm 10^\circ$ lateral bending motion
- $\pm 10^\circ$ axial rotation motion
- Test fluid $37^\circ\text{C} \pm 2^\circ\text{C}$ via Peltier heater/cooler
- Real time logging of position and load
- Clinically and physiologically representative TDR testing
- Backed by ProSim service & support, install, training, follow-up, PM, remote support

SPECIFICATION

Technical *specification.*

Complete machine specification for the Spine Wear Simulator.

PARAMETER	VALUE
Test stations (kinematic)	Up to 3 TDR implants
Test stations (load soak)	Up to 2 TDR implants
Implant types	Cervical & lumbar TDR
Axes per kinematic station	Axial load + FE + LB + AR
Axial load (per station)	Up to 5 kN
Flexion extension	±10°
Lateral bending	±10°
Axial rotation	±10°
Activity profiles	Up to 50 programmable
Operating frequency	Up to 2.0 Hz
Temperature control	37°C ±2°C Peltier heater/cooler
Drive	Electromechanical (motors, drives, gearboxes)
Standards	ISO 18192-1; ISO 18192-3

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 Spine Wear Simulator.

01

Cervical TDR testing

Pre clinical wear evaluation of cervical TDRs to ISO 18192-1 at lower axial loads.

02

Lumbar TDR testing

Pre clinical wear evaluation of lumbar TDRs at higher axial loads, handled by independent per station axial control.

03

Activities of daily living

Up to 50 programmable profiles support replication of typical spine loading environments.

04

Beyond ISO adverse wear

Capable of going well beyond existing ISO requirements for adverse wear testing.

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.

— SPINE · ISO 18192-1

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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