The replacement of lumbar and cervical spinal discs with artificial devices has become a successful surgical procedure over recent years. During the development and regulatory approval processes of such replacements, the implants need to be characterized regarding their mechanical characteristics and wear behavior in a standardized testing environment.

Basic features include:
- Six wear stations plus two load-soak stations
- Four degrees-of-freedom load/motion application
- Angular movements and loads applied with high accuracy
- Specimen mounting in the configuration intended for clinical use
- Controlled environment simulating physiological conditions
- Separate profiles for lumbar and cervical disc replacements
- Adaptable input profiles

The New Endolab Spine Simulator is designed to meet these requirements, providing a standardized testing environment that simulates physiological conditions and accurately characterizes the wear behavior of artificial spinal discs.
EndoLab Spine Simulator

EndoLab has used modified hip wear simulators since 2001 to test spinal disc implants. The new EndoLab Spine Simulator reflects this experience and is specifically designed for total discs, while maintaining the hip simulator configuration option. It also takes the specific requirements into account that are being established by standard bodies.

The simulator bases upon a rigid frame that is mounted on lockable casters. Hydraulic and mechanical components are laid out ergonomically, easy accessible, and require minimal maintenance. Two plexiglas covers protect the interior as well as the operator. An attached manual control panel houses all basic features and allows quick and safe set-up of the system. Connected to a PC, more detailed control and data acquisition functions are available.

Simulator Layout

The EndoLab Spine Simulator allows for simultaneous testing of up to six specimens plus two load-soak reference samples. All testing chambers are comfortably accessible and easily maintained. They are corrosion resistant, so that the specimens can be submersed in physiological testing fluid and kept at 37°C. Four degrees-of-freedom (three rotations and axial force) are applied on each station. Each channel is independently controlled to accurately follow the input signals. The wear stations are mechanically coupled in their angular motions to follow the input profiles exactly. The axial load is actively controlled for one station; the others are hydraulically combined and thus experience the same loading profiles. Not all stations have to be occupied at the same time, any number from one to six (plus two load soak) stations can be active.
Machine parameters at a glance:

- Number of stations: 6 wear / 2 load-soak
- Flexion / Extension: 30°/25°
- Lateral Load: 5kN
- Actuation: Hydraulic cylinders
- Weight: 400kg

Pressure Requirements: 150bar (2176psi), 3L/min

Overall dimensions: 130x65x170cm (width*depth*height)

- Test Chamber: 150ml, corrosion resistant, fluid level sensor
- Temperature Control: Independent chamber heating control

Contact Information:
EndoLab GmbH
Seb.-Tiefenthaler Str. 13
D-83101 Thansau
www.endolab.de
Phone: +49 (0)8031-269076
E-Mail: mail@endolab.de

US customers:
Thorsten Schwenke
Rush University Medical Center
Phone: +1 (312) 942-7128
E-Mail: schwenke@endolab.de

Safety

Various features ensure the safety of the operating technician. Interrupt switches on the cover doors stop the tests if doors are opened. While doors are open, the system can only be run in low pressure mode. Fluid sensors pause the test if a critical level is reached. A quick overview of the latest access control and positioning state is provided on the monitor. The system is designed to be user-friendly and reliable.

The EndoLab Spine Simulator is an easy-to-use, safe, and reliable wear test system. It permits the assessment of long-term performance of lumbar and cervical spines. EndoLab's reliable service and support, combined with EndoLab's reliable service, provide full support and data acquisition for researchers and engineers. The system is designed to simulate the stresses and strains experienced during normal and abnormal spine conditions. The software provides test supervision and data acquisition.

Functionality Without Compromise

The EndoLab Spine Simulator is set-up using the machine mounted manual control panel. Running in set-up control mode, the system monitors the manual control panel and sends data to the controller hardware of the simulator. The software also provides test supervision and data acquisition.

The New EndoLab Spine Simulator

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