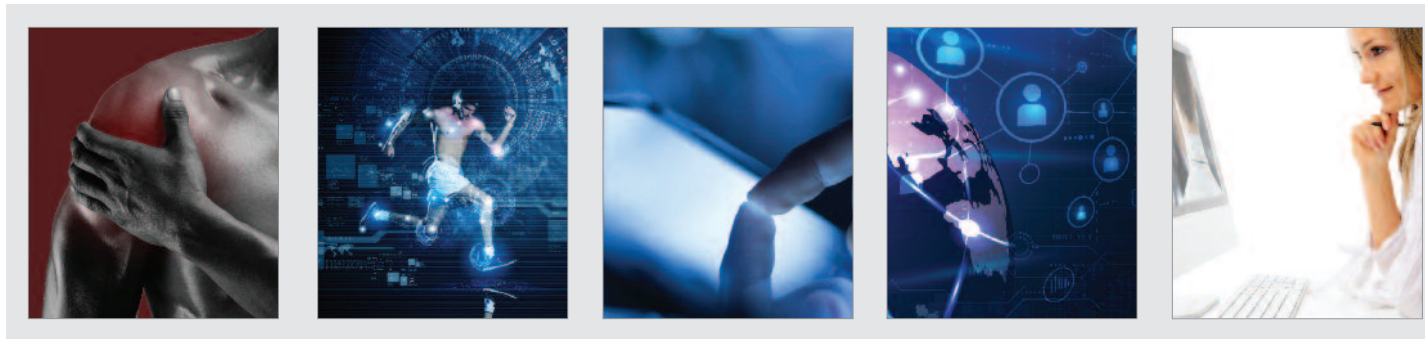


# System4

DYNAMOMETER

Identify, treat and document the physical impairments that cause functional limitations.

For more than 30 years the System 4 continues to be the choice of the most distinguished clinics and research facilities worldwide.



#### **Technology**

Featuring six modes of operation, the System 4 offers pioneering breakthroughs in neuromuscular testing and rehabilitative technology.

#### **Phases of Rehabilitation**

The System 4 allows for six phases of rehabilitation following the model of proving need, progress, and outcome.

#### **Advantage Software**

Comprehensive, easy-to-use, feature-rich software for human performance testing and rehabilitation. **Now with enhanced features.**

#### **Versatility**

System 4 is dependable and versatile – providing the means to take on new challenges and be adaptable to keep pace with progressive thinking and innovation.

#### **Education and Support**

Biodex education programs are designed to ensure clinicians are aware of current developments, and to help understand and utilize the system.



#### **TECHNICAL BRIEF**

#### **MODERN ROBOTIC DYNAMOMETRY**

*Bill Galway, Business Development Director, Biodex Medical Systems, Inc.*

The dynamometer is experiencing a new resurgence as the need for objective data and the markets for which it serves expand.

Read the full story at [www.biodex.com/roboticdynamometry](http://www.biodex.com/roboticdynamometry)

# Distinguish Yourself

For people who know the difference



BIODEX

# The Technology

Based on accepted science, backed by independent studies, supported by clinical protocols and normative data.

## Neuromuscular testing and rehabilitation technologies – Unusually sensitive to patient's limits

- Progressive and interactive features assuring complete control.
- Dynamic and static muscle loading environments provide unlimited combinations of technique and application.

## Isokinetic Resistance Mode

Completely accommodating throughout the entire range of motion

- Resistance continuously matches effort, accommodating to variations in patient force output due to weakness, pain or fatigue at specific points in the individual's range of motion.
- By identifying the area that is weak, a targeted rehabilitation program can be designed. Targeting and concentrating on the impairment allows a faster, measurable recovery.
- The unique impact-free acceleration and deceleration eliminates joint trauma, allowing exercise and testing at more functional speeds.
- Applied torque response ensures limb velocity increases or decreases in proportion to the torque applied during acceleration and deceleration, enabling neuromuscular control measurements.
- Choose concentric and eccentric contractions to perform isolated plyometric exercises.
  - Concentric torque up to 500 ft-lb (680 Nm)
  - Eccentric torque up to 400 ft-lb (542 Nm)

## Passive Motion Mode

Multi-function modality

- Unique control properties allow for early intervention throughout all phases of rehabilitation.
- Passive speeds can be set as low as .25 degrees per second and as fast as 300 degrees per second.
- Ideal for proprioceptive testing – Active joint position testing stimulates joint and muscle receptors and provides a functional assessment of afferent pathways.

## Isometric Mode

Effectively develop strength and decrease joint effusion

- Commonly used pre- and post-operatively or when pain associated when motion is a factor.
- Work the agonist, antagonist or both muscles at specified joint angles.

## Isotonic Mode

Restore function

- Allows velocity to vary while providing inertia-free constant force and concentric or eccentric muscular contractions.
- Higher performance
  - Isotonic force as low as .5 ft-lb (.7 Nm) = 6 inch pound; and as high as 400 ft-lb (542 Nm)
- Selecting force provides protective pre-loading of the joint prior to movement.

## Reactive Eccentric Mode

For submaximal neuromuscular re-education in early phases of rehabilitation

- Patient must produce and maintain a pre-determined minimum force output to initiate movement, loading the muscles surrounding the joint, producing pre-load, thus stabilizing and protecting the joint.
- Eccentric torque up to 400 ft-lb (542 Nm).

## Customized Motor Control

Optional Researcher's Tool Kit

- Ability to apply position based customized motor control and data export.
- Export Data Parser produces .csv files with preformatted header.





[www.biodex.com/s4](http://www.biodex.com/s4)



**CASE STUDY**

**DRUMMER'S SHOULDER GETS IN TUNE**

*Toni LaBarbiera, PT, Rick Lemus, LPTA. Ultimate Rehab in Ridgewood, NJ,*

Biodex Multi-Joint System helps improve American jazz/fusion drummer Lenny White's shoulder weakness. Ultimate Rehab in Ridgewood, NJ applies an integrated approach to Lenny's treatment resulting in a strongly positive outcome.

Read the full story [www.biodex.com/s4/casestudies](http://www.biodex.com/s4/casestudies)

**BIODEX**



[www.biodex.com/s4](http://www.biodex.com/s4)





# Six Phases of Rehabilitation

Following the model of proving need, progress, and outcome.

## 1. Healing Constraints and Proving Need

In **Passive Mode**, gentle range of motion exercise can facilitate the healing process and restore normal range of motion necessary for function.

**Isometric mode** allows safe, comfortable strengthening and testing at specified angles that are safe for both your pre- and post-operative patients.

## 2. Controlling Joint Effusion/Inflammation

Utilizing the **Passive Mode** with other modalities allows the structures around the joint to work as a pump to move blood, lymph and waste products out of the joint. System 4 has the capability to move the limb as slow as .25 degrees per second and with force capabilities as low as .5 ft-lb.

## 3. Restoring Range of Motion

Controlling the System 4 through the GUI interface in **Passive Mode** allows range of motion to be restored by gradually increasing range of motion “on the fly” in a specified direction, at appropriate speeds and safe torque levels.

## 4. Restoring Strength and Proving Progress

Isometric, active assistive, submaximal concentric, eccentric contractions are early strengthening techniques that are available to the System 4 user. More progressive maximal concentric, eccentric contractions are available in **Isokinetic, Isotonic, Passive and Reactive Eccentric modes**. These modes are also suitable for testing and delineating a documentable progression of muscular strength, endurance and joint position sense.

## 5. Restoring Function

**Isokinetic concentric / concentric mode** allows for safe exercise at speeds which approximate function. Impact and inertia-free **Isotonic Mode** allow muscles to contract exactly as they would perform during functional activities. Proprioception, muscular acceleration and deceleration are also activities that are addressed with the Biodex System 4.

## 6. Proving Outcome

**All five modes** can objectively assess isolated joint muscle strength and neuromuscular control.



### RESEARCH STUDY

#### STRENGTH IMBALANCES AND PREVENTION OF HAMSTRING INJURY IN PROFESSIONAL SOCCER PLAYERS

*Jean-Louis Croisier,\* PhD, PT, Sebastien Ganteaume, PT, Johnny Binet, PT, Marc Genty, MD, and Jean-Marcel Ferret, MD From the Department of Motricity Sciences and Rehabilitation, University and CHU of Liege, Belgium, the Clinique Valmont Genolier, Glion, Switzerland, and the Center of Sports Medicine, Lyon-Gerland, France*

Researchers investigate the isokinetic intervention as a preseason screening tool in professional soccer players in predicting hamstring muscle strain and reducing incidence of hamstring injury.

Read the full study at [www.biodex.com/research/hs213](http://www.biodex.com/research/hs213)

BIODEX

# Advantage Software™

## Simple. Logical. Intuitive.

Motivate patients with on-screen charts and graphics, tracking performance and encouraging compliance with a rehabilitation plan.

### Touch Screen for quick, easy operation

- Easy to follow, on-screen wizard guides beginners.
- Advanced features provide flexibility for more experienced users.

On-demand audio and visual aids demonstrate exercise and test patterns.

### Communicate need, progress and outcome, clearly and accurately

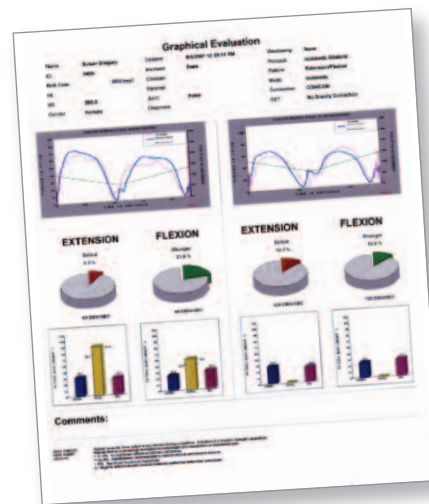
- Export manager produces files with preformatted Excel headers.
- All reports can be printed as PDF's for EMR attachment.

### Isomap - Graphical Imaging Software

This optional report generation utility provides a graphical depiction and quantitative analysis of strength that includes all measures of force, velocity and range of motion. The map allows the clinician to easily identify regional impairments of neuromuscular function and design a specific rehabilitation treatment.

## Rehabilitation Progress Report

Unique to the System 4...on-screen chart and printable reports.



▲ Capture and document every step of the rehabilitation process with Advantage Software.

- Tracks pain, range of-motion and strength throughout the rehabilitation protocol.
- Four other parameters (not necessarily from the System 4) can be entered to present status and progress.
- Stored for easy reference. Printable for referring physicians and third party payers.





- **Data Export Utility** allows users to download all patient test information at one time, including both calculated and raw data.\*
- **Hamstring Injury Risk Management** offers objective testing that isolates muscle-performance data. Test results, combined with established targeted outcomes, can be used for pre-emptive injury screening, managing rehabilitation and determining readiness for return to play.
- **Exported Data Parser** makes it simple to convert .csv files into a report format.
  - **Isokinetic normative data** is available for multiple joints, including data from pediatric through adults, ages 5-83.

*\*Suitable for System 2, 3 and 4*

**BIODEX**



## Expand the use of your Biodex Dynamometer

### Upper Extremity Attachments to accommodate hemiparetic patients



Adaptable for System 3 and System 4 dynamometers, these lightweight, carbon-fiber attachments promote neuro recovery and improve strength, accommodating the impaired grasp associated with hemiplegia. The eccentric mode is especially useful for controlled strengthening.

Visit [www.biodex.com/s4/ue](http://www.biodex.com/s4/ue) for more details.

### Specially designed pediatric attachments



Isokinetic muscle testing on children helps clinicians by providing objective data for neuromuscular control and strength.

### Rehabilitate Hamstring Strains with Software



Objective testing provides valuable, isolated muscle-performance data for pre-emptive injury screening, managing rehabilitation and determining readiness for return to play.

Visit [www.biodex.com/hamstring](http://www.biodex.com/hamstring) for more details.

*Upgrade path available for existing System 4 and System 3 dynamometers.*



# The Markets

## Highly Versatile.

System 4...Sensitive enough for the lowest and discrete measurement demands of researchers with more than enough power for world class athletes.

- **Sports and Orthopedic Medicine**

Provide the best outcomes.

- Hamstring Injury
- Shoulder Dysfunction
- Knee Osteoarthritis
- Lateral Ankle Sprains
- Patellofemoral Dysfunction
- Anterior Cruciate Ligament
- Preseason screening, injury prevention and athletic performance enhancement

- **Workplace Health**

- Helps employers gauge physical competence of applicants
- Reduces injury and workers' compensation claims
- Objective measurement for pre-employment testing as outlined by the Department of Labor



### HEALTH IN THE WORKPLACE

#### CLEVELAND CLINIC UTILIZES BIODEX SYSTEM 4 DYNAMOMETER TO ENSURE EMPLOYEE AND PATIENT SAFETY

As part of its employee health program, the Cleveland Clinic includes a PCET™ test (strength testing) to evaluate if a candidate is capable of performing the essential duties of the job. Utilizing the technology created by IPCS™ (Industrial Physical Capability Services), Cleveland Clinic conducts isokinetic testing on the Biodex System 4 Dynamometer to determine the physical capability of the worker. In addition to safety benefits, Cleveland Clinic has experienced decreased workers' compensation claims and medical costs.

Read the full study at [www.biodex.com/workplacehealth](http://www.biodex.com/workplacehealth)

- **Research**

Used in over 1,000 published studies.

- **Analog Signal Access Interface**

Provides real-time analog voltage output of torque, position and velocity from the dynamometer. Perfect for integration with EMG devices.

- **Customized Motor Control**

Through the use of the optional Researcher's Tool Kit, the advanced user has the ability to control the dynamometer with a position-based pattern.

- **Curve Analysis**

Allows the user to conduct complete neuromuscular evaluation.

- **Military Strength Training**

- Used by military special forces for injury prevention and performance optimization.
- Strength testing identifies residual deficits and predisposition for repeat injury.

- **Neurorehabilitation**

- Helps patients build strength, endurance and coordination. Spasticity management includes objective quantification at specific contraction.
- Passive mode is used for repetitive exercises.
- Eccentric mode is useful for controlled strengthening.
- Specially designed upper extremity attachments for hemiparetic patients promote neuro recovery and improve strength.

- **Pediatrics**

- Used to treat children worldwide.
- Isokinetic muscle testing provides objective data for neuromuscular control and strength.
- Pediatric attachments and age-based normative data are available.

- **Older Adult**

- Objective testing and training for balance disturbances.
- Isokinetic testing will identify weakness.
- Exercise improves ankle and leg strength.

# BIODEX



#### INTERACTIVE eLearning

Accessing the Biodesign online eLearning Center is fast and easy, simply go to [www.biodesign.com/elearning](http://www.biodesign.com/elearning), check on the REGISTER button and follow the directions.



## Education & Training

Biodex is your long-term partner in the development of positive outcomes.

### Biodex University

Established to educate clinicians on the application of Biodex Physical Medicine products.

Biodex combines science with practical application to present a series of eLearning modules, hands-on workshops, evidence-based clinical protocols, training webinars and on-site training all designed to help you better understand and utilize your System 4.

### Interactive eLearning Modules

Designed to improve product utilization and increase clinical value. Specific tutorials provide training on how to setup the System 4, navigate the software, perform testing and interpret results. Provides the convenience of learning at your own pace.

Visit [www.biodex.com/elearning](http://www.biodex.com/elearning) for more information.

### Hands-on Workshops

Biodex provides on-going Application Training Workshops for System 4 owners. These full-day workshops include practical hands-on hardware and software training and are useful for both beginner and intermediate users.

Visit [www.biodex.com/clined](http://www.biodex.com/clined) to learn more and view the current list of workshops.

### Clinical Protocols

A series of evidence-based clinical protocols focused on the rehabilitation of specific conditions using the System 4. Learn how to apply the features of the device for:

- Sports and Orthopedic Medicine
- Neurorehabilitation
- Pediatric Medicine
- Older Adult

Visit [www.biodex.com/system4protocols](http://www.biodex.com/system4protocols) to read more.

### Support

#### Installation

It all starts upon delivery of your System 4. Biodex devices are installed by certified application specialists and include a one day in-service training program. Step-by-step hands-on training will show you how to use and maximize the System 4 to help meet your specific demands.

#### Service

Biodex stays with you every step of the way. Phone support and on-site field service allow you to concentrate on treating patients, not your equipment.



# BIODEX

# Specifications

## SYSTEM 4 PRO™

220 volt required

Touchscreen interface for quick, easy multi-mode operation; isokinetic, isometric, isotonic, reactive eccentric and passive

- Concentric speed up to 500 deg/sec
- Eccentric speed up to 300 deg/sec
- Concentric torque up to 500 ft-lb (680 Nm)
- Eccentric torque up to 400 ft-lb (542 Nm)
- Passive speed as low as .25 deg/sec
  - Passive torque as low as .5 ft-lb
  - Isotonic torque as low as .5 ft-lb

### Clinical Data Station:

- Windows® Operating System
- Biodex Advantage Software
- LCD Flat Panel Touchscreen Color Monitor with Integrated Speakers
- Color Printer

### Attachments:

- Ankle, knee, shoulder, elbow, wrist and hip
- Attachment cart
- Calibration kit
- Manuals and wall chart
- 64 square feet operating space (6 square meters)

### Certifications:

ETL and cETL listed to UL 60601-1, CAN/CSA C22.2 No.: 601.1-M90 and EN60601-1, CE conformity to M.D.D. 93/42/EEC\*

\*When sold complete with computer, monitor and printer.

### Warranty:

One year parts and labor



## Options to System 4 Pro

- Hamstring Attachment
- UE Hemiparetic Attachments
- Dual Position Back Extension/Flexion Attachment
- Closed Kinetic Chain Attachment
- Work Simulation Tools
- Anti-Shear Attachments
- Pediatric Attachments
- Wide Seat
- EMG Analog Signal Access Utility
- Researcher's Tool Kit
- Isomap Graphical Imaging Software

## SYSTEM 4 MVP™

220 volt required

Touchscreen interface for quick, easy multi-mode operation; isokinetic, isometric, isotonic, reactive eccentric and passive

- Concentric speed up to 500 deg/sec
- Eccentric speed up to 300 deg/sec
- Concentric torque up to 500 ft-lb (680 Nm)
- Eccentric torque up to 400 ft-lb (542 Nm)
- Passive speed as low as .25 deg/sec
  - Passive torque as low as .5 ft-lb
  - Isotonic torque as low as .5 ft-lb

### Clinical Data Station:

- Windows® Operating System
- Biodex Advantage Software
- LCD Flat Panel Touchscreen Color Monitor with Integrated Speakers
- Color Printer

### Attachments:

- Ankle, knee, shoulder, elbow and wrist
- Attachment cart
- Calibration kit
- Manuals and wall chart
- 64 square feet operating space (6 square meters)

### Certifications:

ETL and cETL listed to UL 60601-1, CAN/CSA C22.2 No.: 601.1-M90 and EN60601-1, CE conformity to M.D.D. 93/42/EEC\*

\*When sold complete with computer, monitor and printer.

### Warranty:

One year parts and labor



## Options to System 4 MVP

- Hamstring Attachment
- UE Hemiparetic Attachments
- Dual Position Back Extension/Flexion Attachment
- Closed Kinetic Chain Attachment
- Work Simulation Tools
- Hip Attachment
- Anti-Shear Attachments
- Pediatric Attachments
- Wide Seat
- EMG Analog Signal Access Utility
- Researcher's Tool Kit
- Isomap Graphical Imaging Software

## SYSTEM 4 QUICK-SET™

220 volt required

Touchscreen interface for quick, easy multi-mode operation; isokinetic, isometric, isotonic, reactive eccentric and passive

- Concentric speed up to 500 deg/sec
- Eccentric speed up to 300 deg/sec
- Concentric torque up to 500 ft-lb (680 Nm)
- Eccentric torque up to 400 ft-lb (542 Nm)
- Passive speed as low as .25 deg/sec
  - Passive torque as low as .5 ft-lb
  - Isotonic torque as low as .5 ft-lb

### Clinical Data Station:

- Windows® Operating System
- Biodex Advantage Software
- LCD Flat Panel Touchscreen Color Monitor with Integrated Speakers
- Color Printer

### Attachments:

- Ankle, knee, shoulder, elbow, and wrist
- Attachment cart
- Calibration kit
- Manuals and wall chart
- 32 square feet operating space (3 square meters)

### Certifications:

ETL and cETL listed to UL 60601-1, CAN/CSA C22.2 No.: 601.1-M90 and EN60601-1, CE conformity to M.D.D. 93/42/EEC\*

\*When sold complete with computer, monitor and printer.

### Warranty:

One year parts and labor



## Options to System 4 Quick-Set

- Hamstring Attachment
- UE Hemiparetic Attachments
- Dual Position Back Extension/Flexion Attachment
- Closed Kinetic Chain Attachment
- Work Simulation Tools
- Hip Attachment
- Anti-Shear Attachments
- Pediatric Attachments
- Wide Seat
- EMG Analog Signal Access Utility
- Researcher's Tool Kit
- Isomap Graphical Imaging Software



### SYSTEM 4 PRO™

*Patient Positioning System with motorized seat height, front-to-back chair adjustment, fully assisted dynamometer height adjustment, and side-to-side adjustment.*



### SYSTEM 4 MVP™

*Patient Positioning System with fixed seat height, front-to-back chair adjustment, fully assisted dynamometer height adjustment, and side-to-side adjustment.*



### SYSTEM 4 QUICK-SET™

*Patient Positioning System with fixed seat height, fully assisted dynamometer height adjustment, front-to-back chair adjustment.*

Compare Systems  
[www.biodex.com/s4](http://www.biodex.com/s4)





*System 4 PRO shown*

**BIODEX**

## More than 4,000 Biodex Dynamometers in use worldwide.

### BIODEX PREMIER USER LIST

...just some of the elite professional teams and facilities who depend on Biodex

#### US Pro Teams/Notables

Boston Celtics  
Boston Red Sox  
Carolina Panthers  
Chicago Bears  
Dallas Cowboys  
Denver Broncos  
Green Bay Packers  
Houston Rockets  
Indianapolis Colts  
Kansas City Royals  
Los Angeles Chargers  
Los Angeles Dodgers  
Los Angeles Lakers  
Milwaukee Brewers  
New York Jets/Atlantic Health System  
Orlando Magic  
Pittsburgh Pirates  
Seattle Seahawks  
Tennessee Titans  
Texas Rangers  
Toronto Blue Jays

#### International Elite Football Users

Arsenal F.C.  
Aston Villa F.C.  
Blackburn Rovers  
Benfica  
Brazilian National Football Team  
Everton F.C.  
French National Football Team  
Glasgow Celtic F.C.  
Manchester City F.C.  
Napoli F.C.  
Palmeiras  
Santos F.C.  
United Arab Emirates Football Association, Dubai

#### Colleges/Universities

Boston University  
California State University Fresno  
Georgia State University  
Georgia Tech  
Hofstra University  
Indiana State University  
Mississippi State University  
Ohio State  
Penn State University  
Rutgers University  
Seton Hall University  
Syracuse University  
University of Alabama  
University of Arkansas

University of Colorado  
University of Florida  
University of Rochester  
University of South Florida  
University of Texas  
University of Oklahoma

#### Medical Centers /Clinics

Andrews Institute  
Baylor Medical Center  
Brooke Army Medical Center  
Children's Hospital of Philadelphia  
Cincinnati Children's Hospital  
Cincinnati Sports Medicine  
Cleveland Clinic  
HealthSouth Rehab Hospital  
Hospital for Special Surgery  
Hospital for Joint Diseases  
Kaiser Foundation  
Kessler Institute  
Lenox Hill Hospital/NISMAT  
Mayo Clinic Health System  
NYU Langone Medical Center  
Penn State Milton S. Hershey Medical Center  
Pinnacle Physical Therapy  
Rehab Institute of Chicago  
Spaulding Rehabilitation Hospital  
Texas Children's Hospital  
Walter Reed National Military Medical Center  
US Army Rangers

...and many many more

# BIODEX

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