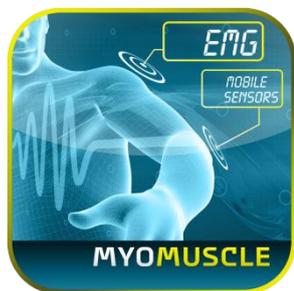


MR3: An Introduction To Noraxon's New Multi-Device Software

Assessed, Quantified and Verified...with MR3 the possibilities are endless. MR3's platform allows for flexible configuration from a single device to a more complex multi-device or multi-sensor combination. Simultaneous recording and measurement of EMG, 2D video, 3D kinematics and multiple different gait and pressure technologies all come together for quick, efficient and synchronous reports.

One Software. Multiple Technologies. Unlimited Solutions.

Module and Software Version/Edition Overview



myoMUSCLE: EMG recording and analysis software (similar functionality to MRXP)

Data Acquisition Perfect for acquiring and exporting data. Includes access to database and viewer.

Essential All the basic functionality you need to record and analyze EMG data. Includes 5 reports, processing (post hoc), database, viewer and report functions (similar to Basic in MRXP).

Clinical Apps Everything the Essential package has with 8 clinical reports, record to video, report editor and multiple record comparison possibilities

Master/Research The most comprehensive EMG software package available with access to all EMG and biomechanical sensor software functions, real time processing and over 20 reports.



myoVIDEO: Video analysis software with advanced drawing tools, angle tracking with unlimited markers, distance, text labels and trajectories tools. Operation is based on a point of interest analysis and video import/export functionality is standard.

High Definition Supports up to three (3) USB HD or DVI cameras.

High Speed Supports up to two (2) Optitrak 100 fps or two (2) PT Grey 120 fps cameras.



myoMOTION: Human Biomechanical 3D model with 16 bones/segments plus external object sensors. Navigation and orientation angles, linear acceleration, linear velocity and pitch, roll and yaw of any given sensor with integrated automatic gait phase detection.

Research Supports up to eighteen (18) sensors, full analysis, reporting and import/export functions.

Clinical Supports up to seven (7) sensors with 5 clinical reports.



myoPRESSURE: Direct integration of foot pressure with 3D pressure mountains, comprehensive gait reports, gait parameters, COP calculations and one-to-one pressure printouts.

T - treadmill Integration of pressure plate instrumented treadmill.

P - platform Integration of floor pressure plates up to 7 meters in length.

S - sole Portable telemetric pressure foot insole system (Medilogic).

Software & Multi-Device Workflow Overview



Functions shared with all modules

General functionality

- 🔄 Standardized workflow scheme for all devices and device combinations
- 🔄 Freely selectable device configuration and combinations between modules
- 🔄 Automatic hardware device detection
- 🔄 Compatible with all Windows (XP, 7 & 8) operating systems

Measurement Menu

- 🔄 Easy drag & drop functionality to add or remove devices to/from configurations
- 🔄 3D muscle maps, illustrated sensor selection maps
- 🔄 Direct access to device configuration settings
- 🔄 Real time signal processing and Biofeedback functions (bar graph, threshold range, sound integration)
- 🔄 Dual screen support and for signal viewer arrangement
- 🔄 Comprehensive signal screen layout management scheme with customizable display arrangements

Database Menu

- 🔄 Database structure organized in three hierarchy levels: project, subject, records
- 🔄 Standard database functions like copy, delete, rename and sort
- 🔄 Comprehensive Subject and Record properties menu
- 🔄 Easy backup and restore function for all data
- 🔄 Export and import functions ASCII, C3D, Excel, Matlab, AVI
- 🔄 Normative database for averaged curves

Viewer Menu

- 🔄 Analysis replay and standard video controls
- 🔄 Signal processing: smoothing, digital filters, MVC-normalization, ECG reduction, time shift correction, derivative & integration
- 🔄 Edit menu to re-scale, delete, correct, process signals
- 🔄 Marker Menu for automatic marker placement
- 🔄 Comprehensive zoom and signal screen arrangements with adjustable screen configuration possibilities

Report Menu

- 🔄 Over 20 ready to go application reports
- 🔄 Report Editor to create self-developed reports or modify existing ones
- 🔄 Comprehensive set of powerful report analysis elements
- 🔄 Export to HTML, Excel, clipboard, ASCII, PDF
- 🔄 Adjustable analysis elements with numerous parameters and data layout selections
- 🔄 Comprehensive comparison analysis for channels, records, videos and normative records

Multi –Device Architecture Supporting These Devices:

- myoMUSCLE - All Noraxon TELEmyo, myoSYSTEM, DTS systems, analog Input boards for external devices and mobile biomechanical sensors
- myoMOTION - Noraxon's camera-free 3D Inertial Sensor System
- myoPRESSURE-T – Instrumented treadmill (utilizes Zebris pressure technology)
- myoPRESSURE-P – Floor pressure plates and pressure walking floors (utilizes Zebris pressure technology)
- myoPRESSURE-S – Portable foot in-sole pressure system (utilizes Medilogic pressure technology)
- myoVIDEO - USB 2.0 high definition cameras, DV camcorders
 - High Speed Video 100/120 Hz – Optitrak (up to 2 cameras – grey scale) and PT Grey (up to two cameras - color)
- Video image grabber for VGA screens such as ultra sound imaging



SOFTWARE	MODULE	myoMUSCLE				myoVIDEO	myo MOTION	myo PRESSURE
FEATURES & FUNCTIONS	VERSION	Data Acquisition	Essential (old Basic)	Clinical	Master	All Versions	Research	All Versions
Measurement								
Muscle & sensor selection maps		X	X	X	X		X	
Multi device (sync multiple MR3 modules)				X	X	X	X	X
Multi device with 3 rd party analog signals		X	X	X	X	X	X	X
Multi activity recording – 2015				X	X	X	X	X
Real time signal processing				X	X			
Feedback – Threshold recording			X	X	X		X	
Dual screen support			X	X	X	X	X	X
1 Camera video recording			X	X	X	X	X	X
2 (or more) Cameras recording						X		
High Speed video integration						X		
Pressure Measurement								X
3D inertial sensor measurement							X	
3D Skeletal motion animation							X	
3D Pressure mountain display								X
Object Sensors							X	
Database								
Subjects: form, properties, info, etc.		X	X	X	X	X	X	X
Copy, delete, edit of records		X	X	X	X	X	X	X
Import & Export (Ascii, Excel, C3D)		Export	X	X	X	X	X	X
Video files import & export						X		
Normative data menu			X	X	X		X	
Viewer								
Smoothing, Digital filter menu			X	X	X		X	
Amplitude normalization			X	X	X			
ECG-reduction			X	X	X			
Time shift correction			X	X	X	X	X	X
Data - editor			X	X	X		X	X
Video analysis functions						X		
2D marker tracking						X		
Play to video file (create .avi)				X	X	X	X	X
Video clip export						X		
Analysis & Reports								
Report template - copy, import/export			X	X	X	X	X	X
Direct report element adjustments			X	X	X	X	X	X
Report Editor (to create own reports)				X	X		X	X
Report Export Ascii Excel, Html			X	X	X	X	X	X
File & channel comparisons			X	X	X	X	X	X
Normative data comparison			X	X	X		X	X
Standard amplitude analysis			X	X	X		X	
Frequency Fatigue			X		X			
Spectrum Curve			X		X			
Averaged Curves			X	X	X		X	X
Clinical Coordination				X	X		X	
Clinical Symmetry				X	X		X	
Clinical Biofeedback				X	X		X	
Clinical Template Training - 2015				X	X			
Clinical Incontinence - 2015				X	X			
Point of Interest analysis			X	X	X		X	
Isokinetics					X			
Clinical & Bilateral Gait				X	X		X	X
Ergonomics Protocols					X			
Jump Tests Force/Contact Plate					X			
Timing Onset and Firing Order					X			
Video analysis, drawing & tracking tools						X		
Gait Parameter Table							X	X
COP Gait line and Butterfly diagram								X
Pressure Foot Prints								X
Tremor Analysis					X			
TMD Analysis					X			
Wavelet Analysis					X			



Features & Functions Detailed Overview

Hardware Setup Menu

- Automatic hardware detection system
- MasterSync (MyoSync) concept to exactly synchronize all connected Noraxon devices as well as 3rd party external devices
- Flexible channel assignment menu for all DTS and myoMOTION sensors
- Selectable radio channels for telemetric systems
- A/D (board) driver menu with Noraxon USB AD board, National instruments AD driver, EMG, pressure, 3D angle-simulation/demo driver
- Integrated recording channels of external analog signals through hardware auxiliary input channels
- Video input configuration menu with access to all video devices connected to the PC
- LED flash based video synchronization for all cameras
- Built-in Video compression or camera specific MPEG compression codecs

Measurement setup menu

- Save & Load function for self created device and sensor setups – enable customized configurations
- Drag & drop functionality to create multi-device combinations
- Anatomical 3D muscle maps for EMG electrode placement
- Visualized selection maps for mobile sensors and stationary devices
- Customized sensor setup list for external sensors
- Free choice of channel types, - units and calibration factors, which can be configured and calibrated to any physical unit, with auto offset function and other display options
- Open selection of channel numbers, type and sampling rate. (Telemetry units have a fixed sampling rate of 1,500 or 3,000 Hz.)
- Unlimited amount of overall measurement channels
- Trigger/Pre-trigger, Start/ Stop functions
- Real-time processing with parallel raw data recording, real-time signal processing (rectification, smoothing, digital filtering, MVC-normalization, integration/derivative and time offset correction)
- Biofeedback menu with bar graph or shrinking circle (incontinence)
- Real-time frequency power spectrum in cascading 3D diagram with mean or median frequency calculation
- Single camera video recording for DV camera or USB high Definition cameras
- 2 – 4 USB HD camera Recording (myoVIDEO only)
- High Speed Video Recording 100/120 (fps) for 2 cameras (MyoVideo only)

Measurement Menu

- Unlimited real time monitoring of all channels
- Unlimited recording of data & signals within the limitations of the hard disk and PC memory capacity (typically 2 GB)
- Global or channel specific zero line calibration
- Selectable time scale zoom for any channel
- Direct access to amplitude scaling and trace speed setting
- Manual marker function within recording (event markers) with free marker naming
- Raw data control within real time processing (toggle mode to raw data)
- Comprehensive channel layout system with unlimited channel overlays, channel sorting via tab system
- Store & Load function for user defined channel and signal layout arrangements
- Two monitors support for selected measurement & signal screens
- 3D visualization & animation of pressure distribution data via isographs
- 3D visualization of 3D angles via skeletal avatar

Database Menu

- Three-level hierarchy system for projects, subjects and records
- Delete, rename, and edit functionality for all database entries
- Bidirectional copy and backup functionality for all data
- Export functions include: ASCII, Binary, C3D, Matlab, Excel
- Import functions include: previous Noraxon formats, ASCII files, C3D (Motion Capture files), video (myoVIDEO only)
- Subject info panels with adaptable subject/patient form, subject picture graphic by clipboard or stored file, RTF and Word-based document window, and comments window



- Record info panels with muscle maps, measurement setup information, applied signal processing, RTF formatted comments and video preview
- Search, sort and filter functionality for all list entries
- Normative data menu for averaged group curves/data with individual access to each record within the pools

Menu Record Viewer – Main screen

- Complete mouse support for all operations
- Scaling and zoom functions for all channels
- Graphical channel and time periods overlay
- Comprehensive channel layout system with unlimited channel overlays and sorting via tab system
- Store & Load function for user defined channel and signal layout arrangements
- Two monitors support for selected measurement & signal screens
- Mouse based marker placement and correction
- Additional histogram display for signal data at cursor position
- Replay, slow motion and single picture shot for synchronized video sequences
- Screen recorder including video files, signals and 3D animation windows
- Easy to use Point of Interest (POI) Analysis, operated by markers

Auto marker menu

- Several routines to place and/or edit analysis markers
- Angle or TTL signal based auto marker functions
- Marker comment function

Signal Processing Menu

- For post hoc processing or restoration of raw data record
- Full wave rectification of bipolar signals
- Smoothing with root mean square (RMS) over moving average, linear envelope
- Amplitude normalization with mean or MVC normalization
- Comprehensive filter functions with band, low, and high pass, Butterworth, FIR, IIR, median,
- ECG – cleaner - eliminates ECG signals but does not affect the true EMG characteristics
- Integration or derivative processing for signals
- All routines can be freely configured, applied channel wise and stored as ready to go processing configurations
- Raw data can be restored at any time

Video Analysis module (myoVIDEO module)

- 3 Marker and 4 Marker Angle drawing tools
- Distance measurement tool
- Text and label tool
- Crosshair tool
- Optional grid, font size and color selection for text labels
- Auto-marker tracking mode (for unlimited amount of markers) with integrated angle curve conversion for tracked angles
- Trajectory visualization for markers
- Slow and high speed replay options
- Direct replay and comparison of two records
- Video synchronization tools for alignment of records during comparison

Edit Menu

- Allows numerical correction of data records (non-restorable edit operations)
- Import/ export functions for myoMUSCLE channels
- Zero line offset correction
- Rescaling of amplitude data
- Video time offset correction
- Delete function for all channels
- Manual correction of single record data (e.g. spike correction)
- Edited records can be stored as a new record



Report Setup Menu

- 🔗 Predefined analysis reports covering the major fields and questions of surface electromyography (myoMUSCLE), recorded videos (myoVIDEO), pressure distribution data (myoPRESSURE) and 3D angle curves (myoMOTION)
- 🔗 Comprehensive online documentation with short introduction and explanation of parameters and guidelines for the interpretation of findings
- 🔗 Functions to create self-defined reports for experienced users
- 🔗 Over 20 ready to go application reports from many application areas of EMG, kinematic data, pressure and video recordings
- 🔗 Fully featured report generator menu to create own analysis reports
- 🔗 Adjustable report elements with comprehensive setup menu to adjust parameter selection and graphical presentation of data in the report
- 🔗 Comprehensive Period definition routines:
 - by user defined intervals
 - by point of interest
 - by step function (in fixed Steps)
 - by manual or automatic marker routines
 - by angle over TTL signals

Analysis Report

- 🔗 Multiple page reports with zoom capability
- 🔗 Export of the whole report in HTML, Excel and Ascii format
- 🔗 Direct copy function of analysis data to the clipboard, paste function for data or graphs to any other Windows application (Excel, Word, Math Cad, etc.)
- 🔗 Direct transfer of findings to the normative database records
- 🔗 Definition of comparison records, internally, to other channels, or externally, to other records or normative files
- 🔗 Flexible print function with PDF printing (requires PDF printer setup)
- 🔗 Direct adjustment of analysis parameter by mouse double click, which opens a comprehensive setup menu for the given analysis frame:
 - Restriction to certain channels, activities within the multi-activity record, raw data, sub phases (in gait cycle)
 - Adjustment of the diagram options, e.g. the type of time normalization for averaged curve diagrams
 - Free choice of amplitude and frequency based analysis parameter
 - Adjustment of the result output options, font type, and diagram and table characteristics

Report Edit Functions

- 🔗 Functions to create or edit your own or customized existing reports.
- 🔗 Access to new analysis elements, to measurement information (comments, configurations) and multimedia elements (videos, pictures) and layout elements.

Analysis Parameters

- 🔗 Amplitude parameters:
 - Mean value
 - Min/Max value
 - Integral
 - Local Min/Max values
 - Range
 - Regression/ linear trend/ variability
 - Velocity
- 🔗 Frequency parameters:
 - Median and mean frequency
 - Total power of signal spectrum
 - Increase/decrease of spectral parameters
 - Frequency shift
- 🔗 Timing parameters:
 - Onset and offset time
 - Duration
 - Threshold related timing
 - Amplitude probability distribution
 - Jump height based on flight time



- Wavelet Parameters :
 - Short time Fourier transformation
 - Morlet and Mexican hat wavelets
 - 3D spectrograms
 - Multi resolution plots

Analysis Concepts

- Curve averaging:
 - selectable time normalization
 - +/- one standard deviation calculation
 - channel to channel and record to record overlay
 - Subject to normative overlay
 - Gait phases analysis
- Multi-Period Trend analysis:
 - for all amplitude parameters
 - for all frequency parameters
 - for all timing parameters
- Point of Interest Analysis:
 - for all amplitude and frequency parameters
 - for video drawing angles, distances and labels
- Gait Analysis:
 - Gait phases parameter
 - Timing parameters
 - Spatial parameters
- Pressure analysis for gait and stance/balance:
 - 2D pressure distribution plots
 - COP and gait line analysis
 - Butterfly diagram
 - Weight distribution
 - Balance Analysis

Info & Multimedia Elements

- Record and subject information
- Subject pictures, other picture documentation
- Video sequences based on marker positions or analysis phases
- Header and footer information (date, page, name etc.)

Layout Elements

- Horizontal and vertical line separator functionality
- Box diagram capability
- Title and graph legends
- Placement of Company logo and other graphics
- Automatic page return, fixed space arrangement

Currently Installed Report Analysis Elements

Channels Curves

Standard amplitude analysis element that displays the selected analysis portion or period. In case there are more analysis periods the record can be shown as a continuous signal, either including or excluding inter-period data. A statistics diagram can calculate amplitude, frequency, sub-period and timing parameters

Average Periods

This element automatically averages all selected analysis periods within a time normalized cycle (optionally without time normalization). The diagram statistics can calculate amplitude and timing parameters

Multi Period Analysis

Any parameter can be analyzed within the time domain sequence of defined periods. Parameter comparisons are possible between records, output options allow data to be presented as histograms (typical), line graphs (multiple periods) or parameter tables.



Sub Period Curves

Sub periods within one global analysis period are calculated and displayed. Sub periods are defined by 3 selectable threshold concepts: Multiple SD, percentage of local maximum and manually entered values. Sub periods can be defined in ratio to a threshold level and threshold range.

Sub Periods of Averaged Curves

Sub periods of averaged curves are calculated based on three threshold concepts: multiple SD, percentage of local maximum and manually entered values. Sub periods can be defined in ratio to a threshold level and threshold range.

Sub Period Trend

Calculates sub-period related timing parameters for several global analysis periods and displays the results as a histogram graph or parameter table

Firing Time/Order

Based on user defined threshold settings, the firing order of muscles in ratio to one global event is calculated, for each single contraction or as a mean calculation over a sequence of contraction activities

Jump Analysis

Drop, Counter Movement, Squat, Bouncing and Jump test analysis, based on contact plates, foot switches or force plates. Optional averaged activations curves plus calculation of ground contact time and flight height.

Power Spectrum

Free choice of FFT length and built-in band pass filter switch. Spectrums can be stored in an independent record, compared and signal processed again!

Frequency Bands

A parameter table or histogram graph of FFT based spectral parameters. Free choice of EMG band and step size, with the output options: as a table, as a bar graph

Amplitude Probability

This analysis allows the calculation of the percentage distribution of amplitude increments for a given time period. It explains how often lower, medium and high EMG data occurred in a test (ergonomics studies)

Wavelet Tool Box

A set of mathematical functions can be chosen which introduce a time resolution to the analysis of frequency contents:

-  Short time Fourier transformation
-  Discrete and continuous wavelets
-  Multi resolution analysis
-  Phase Correlation

myoVIDEO Point of interest Analysis

-  Show video drawings and drawing data
-  Integrates traces, angles and sensor signal data at Point of Interest

Pressure Analysis (myoPRESSURE only)

-  Average or max pressure distribution diagram
-  COP gait line
-  butterfly diagram
-  COP parameter table
-  COP balance/sway analysis

Standard Gait parameter table

-  Based on selectable averaged steps
-  Gait phases parameter – stance, swing, loading response, mid stance, double stance and pre-swing- phases
-  Spatial parameters – Foot rotation, step length, stride length and step width
-  Temporal parameters – step time, stride time, cadence and velocity
-  Single step gait parameter trend