

Instrumented treadmill for gait analysis

The gaitway instrumented treadmill with built-in force plates makes gait analysis of walking and running fast and reliable. It is a practice oriented tool for physical outcome reporting, gait re-education and to build up performance and regain symmetry after an injury. Kistler force plates are widely used for gait analysis in research, clinical and sports environments. Thanks to their reliability and accuracy Kistler force plates have become a worldwide de-facto standard for measuring ground reaction forces. Kistler's experience in this field has led to the development of gaitway, a treadmill with built-in force plates.

The advantages of using a treadmill for gait analysis are obvious. Instead of motivating a subject to walk back and forth in a room while trying to measure a couple of steps, the same task on a treadmill is incredibly simple: get the subject to walk on the treadmill steadily - measure as many consecutive strides as desired-done. This quick and simple procedure for the first time makes gait analysis feasible for professionals who routinely work with patients on a daily basis.



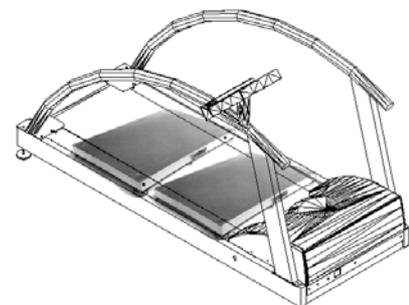
h/p/cosmos gaitway II

The h/p/cosmos gaitway II is a piezoelectric ground reaction force (GRF) measurement system housed in a commercially manufactured treadmill. What makes this treadmill unique is the ability to measure vertical ground reaction force and center of pressure for complete, consecutive, multiple foot strikes during walking and running. The instrumented treadmill system has been designed using a patented tandem force plate design (one plate in front of the other) and includes a patented algorithm which distinguishes left and right strikes. h/p/cosmos gaitway II also simplifies the challenges foot associated with plate targeting found in conventional walkway systems. h/p/cosmos gaitway II can be programmed for speeds as low as 0.1 km/h (0.1 MPH) and up to 22.0 km/h (13.6 MPH). Optional speed 30.0 km/h available. The grade can be adjusted from 0 % (optional -24%) to +24 %. Trials lasting five minutes or more can be easily performed, allowing subtle changes in a gait over time to be quantified. Data from six auxiliary devices can be acquired simultaneous with ground reaction forces.

The h/p/cosmos gaitway II system

The h/p/cosmos gaitway II Instrumented Treadmill System consists of the basic Treadmill-Ergometer model h/p/cosmos mercury med 4.0, the gaitway® software system (Type 9813S15), data acquisition board, two force plates with an eight-channel charge amplifier, six user defined inputs, foot discriminator circuit and belt speed sensor, and all necessary cabling.

The system allows the measurement of multiple foot strikes from walking or running. The only subject requirement is that they must be able to walk so that one heel passes in front of the toes of the other foot. Therefore, shuffling gait cannot be measured by gaitway®. The handrails can be removed to accommodate video systems.



Gait Analysis Made Fast and Reliable

Classical gait analysis can be a time consuming task: the subject has to walk back and forth through the gait lab trying to hit the force plates without consciously targeting them. He or she should "just walk normally" towards the wall on the other end of the room, quickly becoming tired of the process. The speed will change, or the gait pattern, or both. And at the end a couple of strides are averaged and summarized in a report, yet another time consuming task few people are being paid for.

Innovative Opportunities for Professionals

Gaitway gives attractive new opportunities to professionals who routinely work with human beings in a variety of fields ...

- **Orthopedics:** Perform pre- and post operative gait assessment and follow up with ankle, knee, hip and other patients. Full support for clinical research.
- **Rehabilitation:** Allows functional evaluation, gait re-education and physical outcome reporting. The clinical gait reports will be attractive to referring doctors.
- **Sports and sports medicine:** Acquire a pre-season baseline performance in gait and running, monitor changes during season and carefully control rehabilitation and training after an injury. Unlimited use as standard treadmill.
- **Researchers:** Measurements at controlled and even variable speed to study transitions in the gait pattern allows pioneering research. Uphill walking and running as well as downhill (optional reverse belt rotation). Simultaneous data acquisition of other signals.
- **Equipment manufacturers:** Optimize the design or fitting of orthoses and prostheses, test the performance of athletic shoe designs
- **Insurance companies:** Evaluate workers' compensation cases. The Gaitway instrumented treadmill is a functional and practice oriented method of gait analysis. During the measurement, the subject walks or runs naturally and perfectly at ease on the treadmill.

Gait Analysis with the h/p/cosmos gaitway II

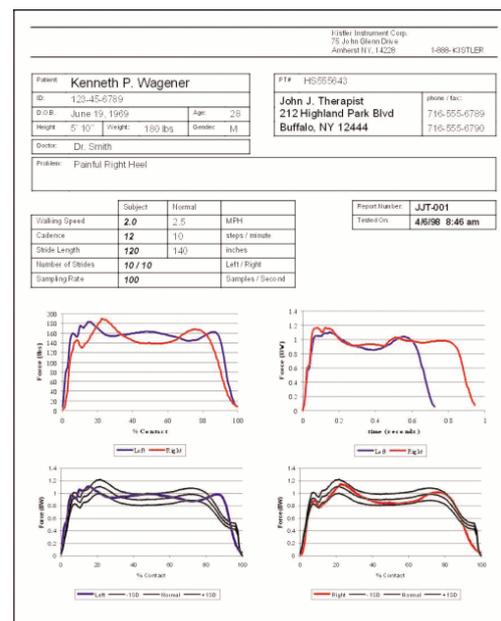
h/p/cosmos gaitway II greatly simplifies gait analysis: The subject gets on the treadmill and with a little bit of assistance from the operator starts walking at the desired speed. He or she may even hold on to the handrail or rehab support for more safety. Typically 10..15 consecutive steps will then be measured at different speeds. The subject doesn't even realize, when the measurement starts. A user definable Gaitway Clinical Report is automatically created and ready immediately for discussion with the subject or forwarding to the responsible person. Gait analysis will never take more than a couple of minutes.



Measure Consecutive Steps without Compromise

Several researches have made attempts in the past to fit force sensors into a treadmill but few have been successful because of the difficulties to separate left from right leg. In Gaitway this problem is solved with a patented tandem force plate design, one force plate in front of the other. An intelligent software allows the subject to walk or run perfectly naturally and at ease while his or her gait is measured over a large number of strides.

The vertical force and the center of pressure as well as over 20 gait analysis parameters are automatically calculated and represented in the Gaitway Clinical Report. The Gaitway Subject Data Base allows powerful search and inter- and intra- subject comparison of gait data. Gait Analysis Made Simple, Quick and Reliable.

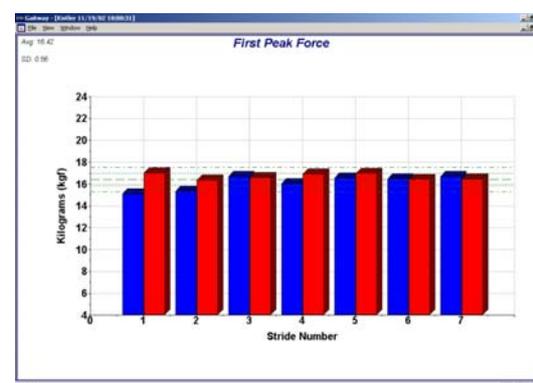
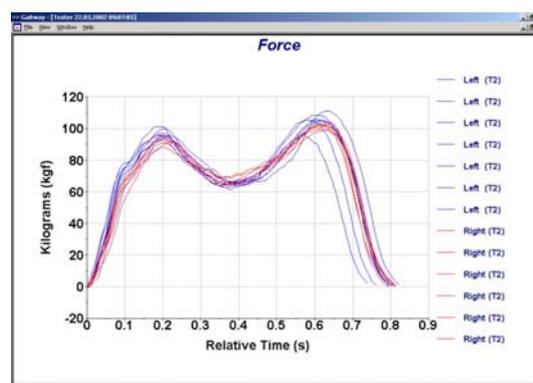


Gaitway® Software

The software is the power behind the system. Gaitway® collects the data from the force sensors located in the bed of the treadmill, separates the left and right foot strikes, plots the results, and enables the user to selectively print and export data to other programs. It is an extremely flexible, easy-to-use Windows program. The vertical force measurements allow for calculation of force, center of pressure (COP), and temporal (time-based) gait parameters. Data from auxiliary devices can be plotted on the same graphs along with these parameters. A powerful database keeps track of trials by subject name, ID, or any other user-specified classification. Multiple trials can be overlaid on a single graph, and the time base can be varied to view the data in absolute time, relative time (i.e. heel strikes aligned at time=0), percent contact, percent step, and percent gait cycle.

Software features

- Vertical force versus time measurements
- Center of Pressure calculations
- Trial Manager allows complete control of database for quick edits or easy removal of unwanted trials
- Graphical comparisons of multiple subject and multiple trials
- Averages and standard deviations shown with the click of the mouse button
- Calculations of over 25 commonly used gait parameters
- Complete Windows graphics control
- Automatic tracking and measurement of subject weight
- Up to six user-defined auxiliary device inputs for combining gait analysis with other sensors
- Multiple time scales allow individual foot strikes to be overlaid and viewed as a percent of foot contact or complete gait cycle
- Subject Manager allows easy additions, edits, or deletions to subject database
- View Manager controls the trials shown on a graph, showing subject's name, date, and description of trial
- Normalizing data by body weights allow for direct comparisons between subjects of all shapes and sizes
- Walking, running, and transition studies
- Symmetry Index for direct left-to-right comparisons



Gaitway® parameters

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|------------------------------------|---------------------------------------|--|
| ■ Force vs. Time | ■ Double Support Time | ■ Impulse |
| ■ Weight Acceptance Rate (Loading) | ■ Single Limb Stance Time | ■ Contact Time |
| ■ Push off Rate (Unloading) | ■ Stride Length | ■ Stride Time |
| ■ First Peak Force | ■ Center of Pressure | ■ Cadence |
| ■ Mid-Support Force | ■ Center of Pressure Step Progression | ■ Up to Six Auxiliary Devices |
| ■ Second Peak Force | ■ Angle of Progression | ■ Averages and Standard Deviations |
| ■ Maximum Force | ■ Base of Support | ■ Symmetry Index |
| ■ Peak 1 to Peak 2 Force Ratio | ■ Anterior/Posterior Range | ■ Metric, english, and normalized units of measure |
| ■ Time to First Peak | ■ Medial/Lateral Range | |
| ■ Time to Mid-Support | ■ Instantaneous Belt Speed Monitoring | |
| ■ Time to Second Peak | ■ Foot Discriminator | |

Specifications of the h/p/cosmos gaitway II

Features

- Complete force measuring treadmill and software system
- Data acquisition board and cable
- Clinical and Research gait analysis applications
- Gaitway® Patient/Subject Manager
- Two force ranges: 2000 N (450 lbf) & 6000 N (1348 lbf)
- Quartz stability and durability maintains calibration
- Removable handrails
- Low step up height for easy on/off access
- Variable speed settings (0.1 to 13.6 mph)
- Variable grade settings (0 – 24%) (opt. -24 to +24%)
- Left / Right foot discrimination

Measurements

- Vertical GRF for walking and running gait
- Center of Pressure measurements
- Capable of trials over five minutes in length
- Transition studies (cadence, grade, pace, and/or speed)
- Loading and Unloading rates
- Angle of progression, Base of support parameters
- Stride Length and Cadence measurements
- Time-based gait parameters & statistics
- Average and Standard Deviations of parameters
- Symmetry Index for direct left/right footstrike comparisons
- Body weight measurement and tracking
- Over 25 useful parameters calculated

h/p/cosmos is certified according to ISO 9001 and EN 46001. **CE 0123** for medical devices.