



# SAFETY FIRST

Zephyr™ Performance Systems  
for first responders and industrial safety

**Medtronic**



## ALL THE DATA YOU NEED TO MONITOR PERSONNEL IN HAZARDOUS ENVIRONMENTS

Personnel monitoring for first responders and industrial safety employees features many elements. But at its highest level, it uses metrics to determine whether or not a subject continues to be safe in their working environment.

Personnel monitoring gives you the tools and data you need. It lets you supplement your subjective review of performance with objective measurements of vital signs and physiological and biomechanical movements.

This scientifically based approach can help take the guesswork out of monitoring your personnel. With valuable insights that can help you monitor:

- Who can become better conditioned to their harsh environments
- Who is ready to perform at their best
- Who needs to be taken out of the field due to safety concerns

# CONSIDER THE BENEFITS

Given all the things they do to keep us safe, you want to do all you can to keep them safe. Hazmat units, fire departments, and even forestry workers use Zephyr™ performance systems to help ensure safety. By monitoring core body temperature, body positioning, and stress levels — all key physiological condition indicators in hazardous environments.

Monitoring lets you:

- **Measure the effectiveness of training regimes over time**
  - Use standard programs like the fitness or beep test to develop baseline measurements
  - Track results of training regimes throughout cadet school to candidate selection and on the job
  - Analyze unit data to fine-tune specific protocols such as CASEVAC or personnel removal drills
- **Objectively quantify subjective measurements**
  - Measure when personnel think they are giving maximum effort to see who is maxing out and who is hiding out
  - Determine who is giving 100 percent and who isn't, and who is able to push through the wall
  - Gain insight into when to push and when it's time to back down
- **Optimize rehabilitation programs**
  - Quantify intensities and loads during training sessions
  - Simulate hazardous situations while monitoring workloads to reduce the risk of further injury
  - Measure vital signs to help determine whether personnel are fatigued, dehydrated, or injured — helping them return to the field quicker



# A SINGLE SOLUTION. A RANGE OF APPLICATIONS.

An inside look at what most thought the human body couldn't do

Zephyr™ performance systems provide a single solution that measures, streams, and logs a wide variety of physiological and biomechanical data. Measure and analyze both units and individuals — up to 100 personnel at a time — using the market-leading BioModule technology and OmniSense software.

A customized and tailored approach to training can lead to optimal results. So you can consistently achieve maximum performance.

## OmniSense Live software

Real-time data on personnel lets you:

- Monitor multiple personnel to facilitate better command and control decisions
- Map duty of care with Google Maps™ or FalconView™ mapping
- View intensities and loads
- Track specific individuals versus units deployed  
Record and analyze conditioning, effort, stress, and exertion

## OmniSense Analysis software

Create reports and comparisons of personnel so you can:

- Help fine-tune training regimens to achieve individual and team goals
- Customize reports in summary spreadsheets, radar plots, and bar graphs
- Export data in .csv and DADiSP formats for export to MatLab™ and LabView™ software
- Develop customized fitness testing utilities, vertical jump tests, speed and training zones, and peak acceleration to fine-tune your personnel on mission specific exercises



## FROM SPORTS TO SPACE

Our performance monitoring has been used to measure subjects' vital signs in more than 500 published research papers — as well as by:

- Professional and collegiate sport teams
- Defense organizations
- Academics and researchers
- First responders
- National governing bodies in countries including England, South Africa, Netherlands, Brazil, and the United States

To learn more about organizations that use Zephyr™ performance systems, visit [zephyranywhere.com](http://zephyranywhere.com).



# A CLOSER LOOK AT WHAT OUR PRODUCTS MEASURE

Zephyr™ performance systems report on more than two dozen physiological and biomechanical parameters based on six inputs. Collectively, this information yields insights into key biomarkers in the monitored personnel.

Here's a look at the data the system gathers and reports on to provide insights into performance.

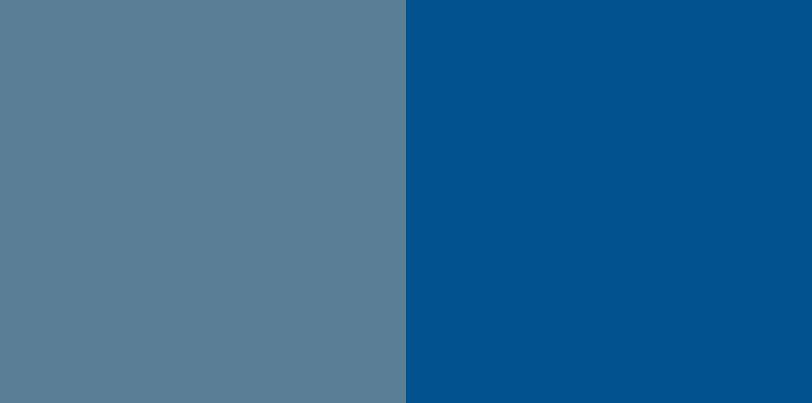
Six inputs	Physiological and biomechanical measurements		Biomarker indicators
Straps and shirts, BioModules and GPS units provide these six inputs:	Based on the six inputs, Zephyr™ systems OmniSense software reports these biometrics:		The combination of the biometrics yields insight into these markers:
<ul style="list-style-type: none"> <li>ECG</li> <li>Respiration</li> <li>Estimated corebody temperature</li> <li>Accelerometry</li> <li>Time</li> <li>Location</li> </ul>	<ul style="list-style-type: none"> <li>Heart rate(HR)</li> <li>Breathing rate</li> <li>HR variability (HRV)</li> <li>HR confidence</li> <li>Estimated corebody temperature</li> <li>Impact</li> <li>Activity</li> <li>Posture</li> <li>Caloric burn</li> <li>% Heart rate (max)</li> <li>% Heart rate anaerobic threshold (AT)</li> <li>Accelerometry</li> </ul>	<ul style="list-style-type: none"> <li>Physiological and mechanical intensity and loads</li> <li>Training loads and intensity</li> <li>Jump</li> <li>Explosiveness</li> <li>Peak force</li> <li>Peak acceleration</li> <li>GPS speed</li> <li>GPS distance</li> <li>GPS elevation</li> </ul>	<ul style="list-style-type: none"> <li>Fatigue — HR recovery</li> <li>Readiness — HR variability (HRV)</li> <li>Safety — max HR, core body temperature, location</li> <li>Over-training and under-training evaluation — intensity and load</li> <li>Fitness improvement — VO<sub>2</sub> max, HR @AT</li> <li>Caloric expenditure and burn</li> <li>Agility — accelerometry, speed, and distance</li> <li>Athlete management — intensity and load</li> <li>Stress — HRV</li> </ul>

## OmniSense Live Software

The dashboard lets you:

- Customize the view by name, unit, and exercise
- Display up to 100 personnel at one time
- Set alerts for safety, mechanical loads, core temp, HRV, location, and other parameters





# BENEFITS THAT ARE IMPOSSIBLE TO IGNORE.

Here's why the Zephyr™ family of performance products is the top choice for many elite units.

FEATURE	BENEFIT
Monitoring of personnel for signs of heat stress or fatigue	<ul style="list-style-type: none"> <li>▪ Uses estimated core body temperature, HR recovery, resting HR, and HR variability</li> <li>▪ Monitors training intensity and load over time to assist in training customization and ultimately improve athlete management</li> </ul>
Live monitoring of large groups	<ul style="list-style-type: none"> <li>▪ Allows real-time insight into the potential for conditions such as fatigue, over- or under-training, and heat stress</li> <li>▪ Provides configurable thresholds in real-time monitoring to allow concurrent management of training intensity and loads for each personnel</li> </ul>
Team and individual training and fitness reports	<ul style="list-style-type: none"> <li>▪ Shows baseline metrics such as anaerobic threshold, HR recovery, and VO<sub>2</sub> max</li> <li>▪ Lets human performance resources compare and contrast personnel, and ascertain improvements</li> </ul>
Measurements of kinematic and physiological variables	<ul style="list-style-type: none"> <li>▪ Measures explosiveness from a dash or sprint start</li> <li>▪ Supports customizable speed and training zones</li> </ul>
Detection and monitoring of anaerobic threshold	<ul style="list-style-type: none"> <li>▪ Provides a method of monitoring fitness</li> <li>▪ Allows breathing rate-triggered monitoring of anaerobic threshold for intensity-based training</li> </ul>
Comprehensive analysis capabilities	<ul style="list-style-type: none"> <li>▪ Detailed analysis of an individual's training and performance</li> <li>▪ Trend analysis of individuals or teams over multiple practices or sub-sessions</li> <li>▪ Quick and easy comparisons between players</li> </ul>
GPS and player positioning	<ul style="list-style-type: none"> <li>▪ Provides GPS logging data that works with Google Maps™ and FalconView™ mapping</li> </ul>
Eliminate artifact issues	<ul style="list-style-type: none"> <li>▪ OmniSense software algorithms and mechanical design address noise and movement artifact issues that affect other systems</li> </ul>
Transmission range	<ul style="list-style-type: none"> <li>▪ Provides an ECHO transmission, inside or outside, for use across multiple fields or hazardous environments</li> </ul>
Extended range	<ul style="list-style-type: none"> <li>▪ Offers available antenna repeaters to extend coverage to an area of approximately 4 million square feet with no dead zones</li> </ul>

# GARMENTS. SENSORS. DISPLAY. COMMUNICATION.

## Details of the Zephyr™ performance systems workflow

The Zephyr™ performance systems include garments, sensors, display capabilities, and communication devices, along with robust software.

### Spotlight on BioModule compact physiological monitoring module

The BioModule compact physiological monitoring module lets you capture and transmit comprehensive physiological data on the wearer via mobile and fixed data networks. For remote monitoring of human performance and condition in the real world.

Here's a look at the key product features and specifications:

Connectivity	Uses ECHO to provide heart rate, RR interval, speed, and distance to Android™ devices
Strap, shirt, or BioPatch HP device	Machine-washable straps, compression shirt, and flame-resistant moisture wicking loose fit shirts and patches offer comfort and accuracy
Garment washes	80
Water resistance	Up to 1 meter: IP67 certified
Data capacity	Logs and stores up to 20 days of data
Heart rate range	25–240 BPM
Breathing rate range	4–70 BPM
Acceleration range	±16g
Battery type	Rechargeable lithium polymer
Battery life	24 hours per full charge
Charge cycles	300
Transmit range	Up to ~300 feet; extending to up to ~1000 feet with antenna and amplifier
Frequency	2.4–2.4835GHz
Operating limits	Temp: -10° C–60° C Humidity: 5%–95%



## LEARN MORE

For a closer look at performance monitoring and the products profiled here, visit [zephyranywhere.com](http://zephyranywhere.com).



# REINVENTING WHAT'S HUMANLY POSSIBLE



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