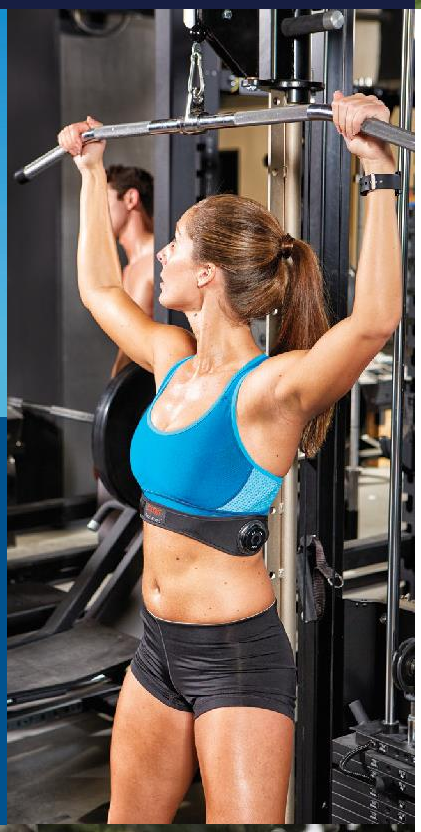
MEASURE PERFORMANCE IN A NEW WAY

Zephyr BioPatch™ Monitoring Device for Human Performance (HP)



The technology of a medical-grade monitoring device — in the spectrum of performance monitoring

Whether you're in research, sports, or the military. You might need quick physiological and biomechanical readings. That's why we developed the BioPatch™ HP monitoring device.

An easy, off-the-shelf choice for measuring respiration rate, heart rate variability, and other performance factors.

Medtronic

Components

- BioModule™ device
- BioModule™ device holder
- Firmware and config tools for OmniSense™ software
- Compatible for use on self-adhesive electrodes with 3.5 mm male snap interface. Performs optimally with foam or cloth electrodes that include conductive solid hydrogel. For heavy perspiration, cloth electrodes provide optimal adherence.

Get physiological and biomechanical data — quickly and easily

BioPatch™ HP device features

Our BioPatch™ HP monitoring device is ideal for those who don't require a medical grade monitoring product.

The device uses:

- Impedance to measure respiration
- Standard single lead electrodes

It features:

- Full capability with OmniSense™ Live and OmniSense™ Analysis software
- Support of 3G (Bluetooth low energy capable) BioModule™ devices
- An accelerometer built into BioModule™ device with orientation mounting option on the sternum
- A 3-axis accelerometer
- Logging mode for up to 500+ hours
- USB-data download, charging, and configuration

It measures:

- AAMI/ANSI E38
- Heart rate
- Respiratory rate
- Activity/posture (Lying/Standing/Sationary, Walk, Run)

And has internal algorithms for:

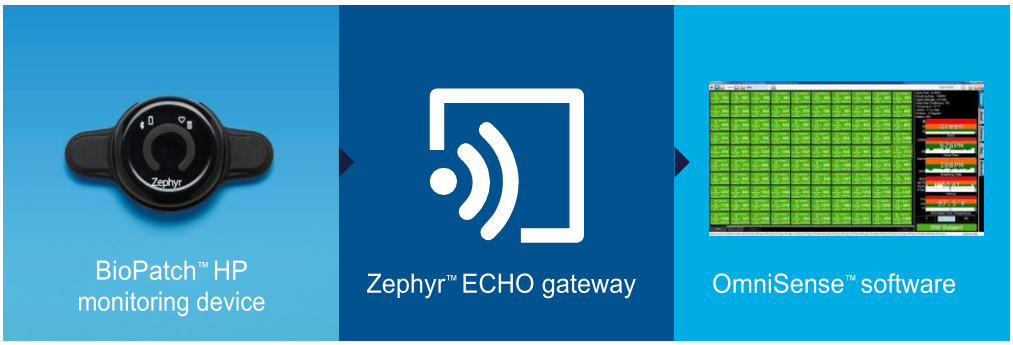
- Calories
- Activity minutes
- Heart rate variability

Third body mounting option

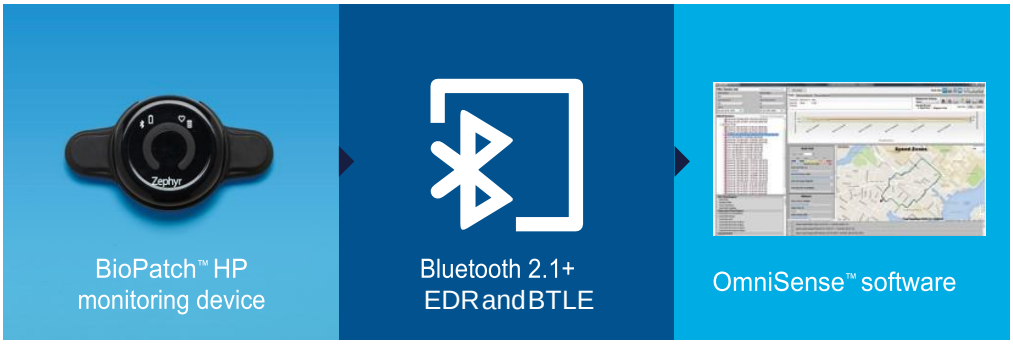
The BioPatch™ HP monitoring device provides a body mounting option on the sternum — in addition to the strap and compression shirt — to measure physiological and biomechanical movements.

Simple and effortless data transmission

Live data transmission: ECHO gateway



Live data transmission: Bluetooth



What it measures

The BioPatch™ HP monitoring device collects nearly two dozen physiological and biomechanical parameters, based on six inputs.

Measured parameters	Physiological and biomechanical measurements		Biometric indicators
The Zephyr BioPatch™ HP device provides data on:	Based on these six parameters, OmniSense™ software reports biometrics on:		These biometric measurements yield insight into markers of:
• ECG • Respiration • Estimated core body temperature • Accelerometry • Time • Location	• Heart rate (HR) • Breathing rate • HR variability • HR confidence • Estimated core body temperature • Impact • Activity • Posture • Caloric burn • % heart rate (max) • % heart rate (aerobic threshold, or AT) • Accelerometry	• Physiological and mechanical intensity and loads • Training loads and intensity • SpO_2 • Jump • Explosiveness • Peak force • Peak acceleration • GPS speed • GPS distance • GPS elevation	• Fatigue (HR recovery) • Readiness (HR variability) • Safety (max HR, core body temperature, location) • Overtraining and under-training (intensity and load) • Fitness improvement (VO_2 max, HR at AT) • Caloric expenditure and burn • Agility (accelerometry, speed, and distance) • Athlete management (intensity and load) • Stress (HR variability)

Components

BioPatch™ HP device and its associated components:

Component
Zephyr BioPatch™ HP monitoring device (BioModule™ device, BioModule™ holder, charger, cable)
Zephyr BioModule™ device
Zephyr BioModule™ holder
Zephyr single-bay BioModule™ charger

Zephyr BioPatch™ HP monitoring device	
Zephyr BioModule™ device	
Zephyr BioModule™ holder	
Zephyr five-bay BioModule™ charger	
Zephyr single-bay BioModule™ charger	

Transmission data

The following parameters are transmitted in versions of the summary data packet. Reporting rate: 1 Hz.

Parameter	Range/units	Description
HR	0–240 beats/minute	
Breathing rate	0–70 breaths/minute	
Posture	From negative 180 to 180 degrees from vertical	0º = vertical, + = lean forward
Activity level	0–16 g reported as VMU	0.2 VMU ~ walking, 0.8 VMU ~ running
Peak acceleration	0–16 g	Any axis, previous second epoch
Battery level	~3.5–4.2 volts	3.5 V ~ 0%, 4.2 V ~ 100%
Breathing wave amplitude	Bits	Not used
ECG amplitude	mV	
ECG noise	mV	
HR confidence	0–100%	Valid if > 20%, multiple components
HR variability	Milliseconds	300 beat SDNN
Red/orange/green (ROG) status	Red/orange/green	Used in OmniSense™ software
Status info	Decimal >> binary	Multiple internal status flags
Link quality	0–254	Bluetooth link quality (0 = poor)
RSSI	From negative 127 to 127 dB	Received signal strength indication
Tx power	From negative 30 to 20	Bluetooth transmit power
Estimated core temperature	Degrees	HR based
GPS position	Lat/long	With supported GPS
GPS speed	Miles/hour	With supported GPS
Impulse load	Newtons (cumulative)	Measure of mechanical load
Walk step count	Count	
Run step count	Count	
Bound count	Count	
Jumpcount	Count	
Minor impact count	Count	Impact > 3 g
Major impact count	Count	Impact > 7 g
Average rate force development	Newtons per second	Measure of explosive power
Average step impulse	Newton seconds	Meaure of energy expended
Average step period	Seconds	Time duration of step
Jump flight time	Seconds	Duration of jump event
Peak g phi angle	0–180 degrees (0 = vertical)	Vertical direction of peak impact
Peak g theta angle	From negative 180 to 180 degrees (0 = forward)	Horizontal direction of peak impact

These data packets may also be enabled.

Data Packet	Reporting Frequency	Description
Breathing waveform	18 Hz	Raw sensor output
ECG waveform	250 Hz	Processed output
Accelerometer waveform	50 Hz	X/Y/Z accelerometer data
RR interval	Per event	RR intervals in milliseconds
BB interval	Per event	Breath-breaths intervals in milliseconds

Logged data

The following parameters are in the enhanced summary log format. Reporting rate: 1 Hz.

Parameter	Range/units	Description
HR	0–240 beats/minute	
Breathing rate	0–70 breaths/minute	
Posture	From negative 180 to 180 degrees from vertical	0º = vertical, + = lean forward
Activity level	0–16 g reported as VMU	0.2 VMU ~ walking, 0.8 VMU ~ running
Peak acceleration	0–16 g	Any axis, previous second epoch
Battery voltage	~3.5–4.2 volts	3.5 V ~ 0%, 4.2 V ~ 100%
Battery %	0–100%	
Breathing wave amplitude	Bits	Not used
ECG amplitude	mV	
ECG noise	mV	
HR confidence	0–100%	Valid if > 20%, multiple components
HR variability	Milliseconds	300 beat SDNN
System confidence	0–100%	
GSR status	Not used	
ROG time	Seconds	Time in current ROG status
ROG	Red/orange/green	Subject status reported in OmniSense™
Vertical acceleration minimum	From negative 16 to 16 g, in previous epoch	Vertical axis
Vertical acceleration peak	From negative 16 to 16 g, in previous epoch	
Lateral acceleration minimum	From negative 16 to 16 g, in previous epoch	Side-side axis
Lateral acceleration peak	From negative 16 to 16 g, in previous epoch	
Sagittal acceleration minimum	From negative 16 to 16 g, in previous epoch	Front-rear axis
Sagittal acceleration peak	From negative 16 to 16 g, in previous epoch	
Status info	Decimal >> binary	Multiple internal status flags
Link quality	0–254	Bluetooth link quality (0 = poor)
RSSI	From negative 127 to 127 dB	Received signal strength indication
Tx power	From negative 30 to 20 dBm	Bluetooth transmit power
Estimated core temperature	Degrees	Based on HR
Aux ADC 1/2/3	Not used	
Impulse load	Newtons (cumulative)	Measure of mechanical load
Walk step count	Count	
Run step count	Count	
Bound count	Count	
Jump count	Count	
Minor impact count	Count	Impact > 3 g
Major impact count	Count	Impact > 7 g
Average rate force development	Newtons per second	Measure of explosive power
Average step impulse	Newton seconds	Meaure of energy expended
Average step period	Seconds	Time duration of step
Jump flight time	Seconds	Duration of jump event
Peak g phi angle	0–180 degrees (0 = vertical)	Vertical direction of peak impact
Peak g theta angle	From negative 180 to 180 degrees (0 = forward)	Horizontal direction of peak impact

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