TECH TALK: Polar Vantage V2 and H10 Heart Rate Monitor (HRM)

The Polar Vantage V2 and H10 Heart Rate Monitor are capable of measuring heart rate. The Heart Rate and Heart Rate Variability measures are comparable to that obtained from medical grade devices. The table below is a technology selection decision support tool and not a substitute for business procurement processes. Information is correct at time of publication.

What's in the box	Technical specifications		Set up investment and required skills
Image source: Polar	**Connectivity**		**Key Compatible Software**
	Connection:	Bluetooth Low Energy (BTLE) Watch to App BTLE HRM to watch USB 2.0 (custom adaptor) to type A port	• Polar Flow for capturing streaming data (iOS and Android app, HR only) • Access to Polar Flow web portal for visualising and downloading raw data
	Power:	Battery (< 2 hr charge time)	
	Access:	Data accessed using a Polar Flow account	**Key Knowledge (depending on application)**
Hardware			• Using the devices is straightforward, interpreting the results and getting useful measures requires a biomedical/ physiological background
Manufacturer: Polar	**Tracking and Applications**		
Model and release date: Vantage V2 (watch) and H10 (Heart Rate Monitor, HRM)	Heart Rate	HR is recording continuously and sampled every second. Polar Vantage V2 has wrist-based heart rate, H10 HRM is more accurate	• Software such as Kubios is useful for Heart Rate Variability
Price (est): AU $800 (incl. GST and shipping)	Heart Rate Variability (feature only using H10 HRM in combination with watch)	A Polar watch in combination with the H10 HRM and connected with Bluetooth will record the *millisecond* interval between heart beats (RR interval).	**Practical Task Setup** (as experienced by engineers) • Easy to use "out of the box". There are quick start guides for the devices, the app and the online download portal
Weight: 52g (watch), 60g (HRM) Size: Case: 47 x 47 x 13 mm Wrist: 120 – 215 mm	Other features	Polar watches have various other features that are not reported here	• Offline recording is easy, the App cannot be used if you want HRV (the most important measure)
Battery: > 40 hr streaming > 400 hr	Future Development	Devices can only be used to get summary data but there is an API (application programming interface) and Software Development Kit for the H10 and watch and custom applications can be developed	• Because of the chest strap, the measures are relatively insensitive to interference • The heart rate monitor reports the interval and does not capture the waveform • Getting the data is easy, processing the data requires custom tools or commercially available software such as Kubios.
Measure and sample rate: Heart Rate (HR, 1 Hz) Heart Rate Variability (HRV, 1000Hz, reported at R interval peak)			
Note: A polar watch is required for HRV. Other models are available			

PEOPLE PERSPECTIVE: Polar Vantage V2 and H10 Heart Rate Monitor (HRM)

Task/Environment Suitability	Usability Features	Task/Environment Considerations	Usability Considerations	Key Opportunities & Applications	Guidance for Implementation
Portable The chest strap is the only item that needs to be worn; watch only needs to be in close proximity (<10m) to chest strap. This is useful for tasks where you can't use watches **Tasks** The Heart Rate monitoring features are insensitive to knocks and bumps Over long periods the device will capture usable data even with disturbances	**Performance** Very quick and easy to set up the device and begin data collection. Menus are simple to navigate and if worn alone the watch is measuring HR and delivering feedback Visualising the data is quick and intuitive though it needs more interpretation: HR is a straightforward measure of work intensity, HRV is meaningless without skilled interpretation **Future applications** Desktop and mobile API can access the H10 sensor without a watch and this may be developed to give real time feedback **Safety** HRM are used extensively in sport and research and their use is safe. The electrodes have high biocompatibility and have low risk of allergy. HRM is hand washable	**Accuracy/performance will be reduced by:** Dry connections to the skin and a loose fit will alter the HRM interpretation of heart rate and variability Loose fitting will significantly affect the reliability of detecting wrist-based HR The electrodes on the HRM should be cleaned with gentle detergent regularly and rinsed with freshwater between users The HRM should not be folded or bent and is otherwise resilient to adverse conditions, evidenced from its sporting background	**Performance** The quality of the data depends on the device having been properly secured to the chest/wrist. Chest strap should be firmly secure otherwise the device may miss count/time events **Shared use** The HRM may be less suitable for shared use as the elastic band may stretch and become ill-fitting overtime **Real time feedback to users** (e.g. HR and work intensity) via watch may cause distraction, at times **Data Usability** Getting useable metrics from the data isn't straightforward (particularly for HRV) and requires interpretation by someone biomedically trained	**Health and Safety** Long- and short-term physiological monitoring may help identify stress and changes that could be precursors of injury (i.e. someone showing fatigue symptoms should be allocated to alternative duties) **Ergonomic Analysis** Can help better understand workforce performance and identify risks and contributing factors **Future applications** The technology is progressing and using Polar watch and HRM or a similar device can help build familiarity for when technology matures	Accessing the data is a smooth process and is divided according to day/time and device if you are using more than one Unless you have in-house capability to process the data (e.g. using programming software Python or MATLAB) accessing the most useful metric (HRV) will require 3rd party software If using these types of devices, it would be beneficial to accompany their implementation with workforce education and training sessions around heart health and stress management strategies to lower HR (e.g. breathing exercises) The device collects physiological (health) data thus It will be important to have data privacy policies in place prior to use with a clear understanding of when data will be collected, and for what purposes it will be used. Policies and procedures will also need to address duty of care responsibilities in terms of data (especially HRV) potentially identifying health conditions. Secure data storage is essential

These suggestions are formulated from a human factors research trial involving the integrated use of augmented reality and collaborative robots during assembly of an electrical cabinet.
Selection and implementation of a technology should consider the abilities of the person doing the task, the task requirements, and the environment in which the work is to be undertaken.