

## 11 TECHNICAL SPECIFICATIONS

Description	Value
Number of vibration levels	16 on a logarithmic scale
Fundamental frequency ( $f_0$ ) @ maximum vibration strength	158.3±2.4 Hz
Root mean square acceleration ( $a_{RMS}$ ) @ maximum vibration strength	55.5±9.5 m/s <sup>2</sup>
Vibration motor spin-up time ( $t_{spin-up}$ ) to maximum vibration level	114±26 ms
Vibration motor spin-down time ( $t_{spin-down}$ ) from maximum vibration level	<75±8 ms
Noise level @ 10 cm @ maximum vibration strength	47.7±2.3 dBA
Maximum number of tactors that can be controlled by a single control module	16 total
Maximum number of actions in a pattern	50
Latency using USB (From sending PlayPattern command over UDP until tactor starts vibrating)	20±3 ms
Auto shutoff time (only for BT connection)	60min after last tactor actuation. On USB, always ON.
Valid offsets of an action in a pattern	[0,5,10,...,60000] ms; resolution 5 ms
Valid durations of an action in a pattern	[0,5,10,...,60000] ms; resolution 5 ms
Wired data connection	USB 2.0 (type C connector)
Wireless data connection	Bluetooth® Low Energy
Control module dimensions ( $l \times w \times h$ )	57 x 48 x 14 mm
Tactor dimensions ( $l \times w \times h$ )	34.4 x 16 x 11.4 mm
Li-ion battery	3.7 V, 800 mAh
Operation time on full battery charge	4-8 hours (depending on usage)
Battery charge time	With 5V adapter supplying ≥500 mA or a normal USB 2.0 or higher port: ≤1.5 hours  From low power USB port (100 mA): ≤7 hours
Supported operating systems	Windows 11 (32-bit and 64-bit), Mac OS X >12, Linux, Android 13.
Composition of textile strap set (if supplied)	85% Polyamide / 15% Elastomer
Composition of OPSskin (if supplied)	COOLMAX Mesh 83% Polyester / 17% Elastan (Lycra)  Waistband: 85% Polyamide / 15% Elastomer
Composition of fully Velcro enabled shirt (if supplied)	85% Polyamide / 15% Elastomer
Bluetooth Dongle	Bluegiga BLED112 Bluetooth Smart Dongle (BLE 4.0)

Note:

The vibration specifications have been measured under conditions that are expected during normal use. This means that the Haptic Development Board was pressed against the skin that was covered with a t-shirt by elastic textile as provided by Elitac Wearables. The Haptic Development Board itself was not covered by any additional clothing. For more details about the vibration specifications please consult the report TNO 2013 R10374\_Tactile specification of the Haptic Development Board.pdf.