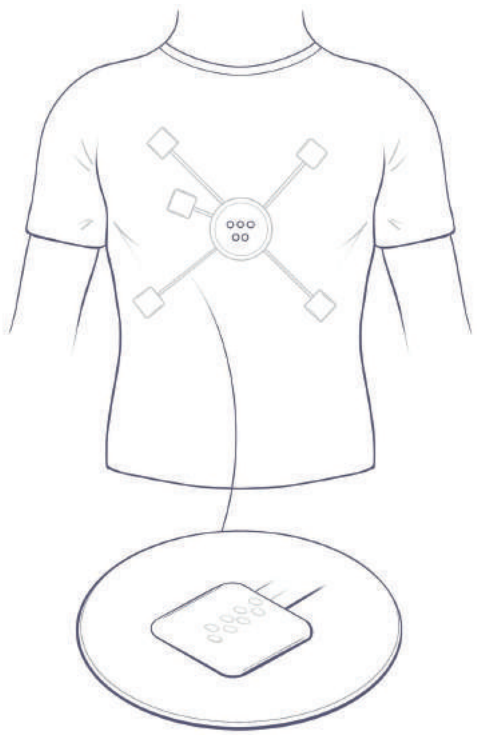
ElectroSkin

ElectroSkin is Nanoleq's line of dry electrodes for smart textiles. ElectroSkin is the most reliable and convenient dry electrode in the market (Fig 1 and Fig 2), and the optimal solution for companies willing to differentiate themselves in their industry, whether this is MedTech, workwear, safety, or sports. ElectroSkin electrodes are built with a biocompatible silicone surface with optimal skin-electrode impedance which enables the highest signal quality and electrostimulation feeling in dry-state. Integration of textiles and electrical connections is fast and reliable thanks to a smart connection interface. Textile manufacturers can now easily form electrical connections, without electronics expertise and without the need for crimping or soldering.



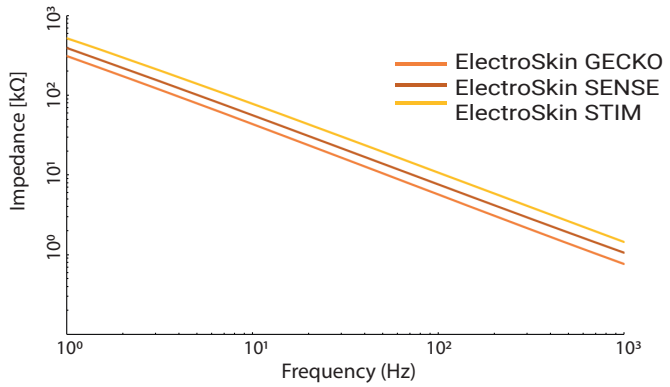


Fig 1. Skin-electrode impedance measurement of ElectroSkin electrodes over a wide range of frequency.

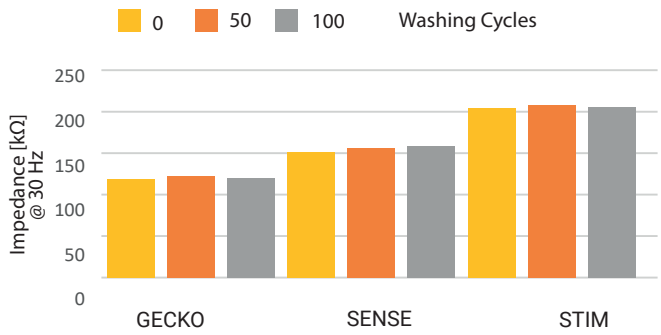


Fig 2. Effect of 0-50-100 washing cycles on the skin-electrode impedance of ElectroSkin STIM, SENSE and GECKO. Values obtained at 30 Hz. The effect of washing is negligible on the skin-electrode impedance.

High SNR | Light Weight | Stretchable | Washable | Easy to Laminate | Optimal Skin Adhesion

GECKO

Enhanced adhesion to the skin and ultra-low skin-electrode impedance. No need for compressed garments to achieve your goal. When it comes to biosignal monitoring or electrical stimulation, GECKO provides the best experience.

Sports: ECG, EMG

MedTech - Workwear - Wellbeing: ECG, EMG, EEG, EIT, EMS/FES/NMES

SENSE

A high-quality dry electrode with low skin-electrode impedance. SENSE maximizes the signal quality in biosignal monitoring applications, without the need for wetting and after many times washing and wearing.

Sports - MedTech - Workwear - Wellbeing: ECG, EMG, ECG, EMG, EEG, EIT

STIM

A dry electrode optimized for electrical stimulation in the sports industry. Its skin-surface contact and elastic modulus, are optimal for comfortable electrostimulation on dry-state after many times washing and wearing.

MedTech - Wellbeing- Sports: EMS

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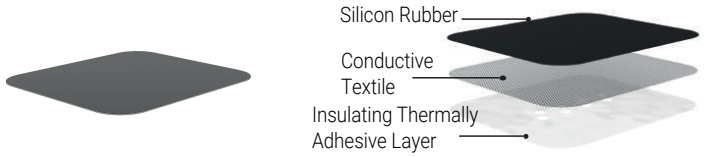
ElectroSkin STIM

Electrode Structure

Our electrodes consist of a biocompatible silicon surface that interfaces with the skin, a conducive layer in the core, and a thermo-adhesive backside with a designated contact spot for electrical connections.



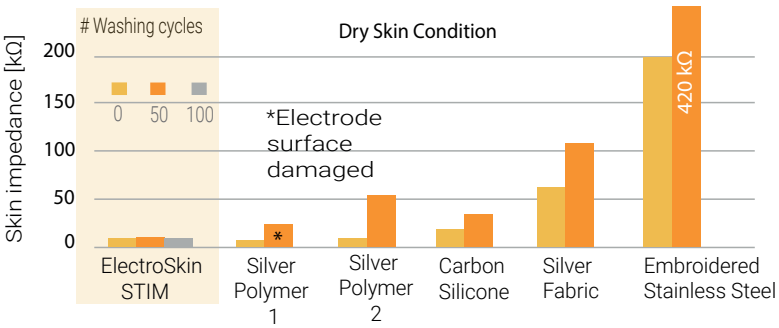
Simple Textile Integration

ElectroSkin electrodes contain a thermo-adhesive backing and can be hot-pressed to the garment in a single step. The electrical connection can be established easily and reliably, e.g. to magnetic or snap buttons, via Nanoleq's PhantomLink connection patch. For electrodes that are placed further away from the electronic module, we recommend textile wires and connectors from our PhantomTape product line for optimal durability.

Lamination temperature	130 - 150 °C
Lamination time	20 - 30 s
Electrical connection to: (instructions available)	PhantomTape X, PhantomLink, textile connectors.

High Signal Quality and Fully Washable Electrodes

Garments using ElectroSkin STIM can be washed without a loss of quality. Dry electrodes based on polymer coatings with silver show a good impedance and stimulation feeling when worn the first time. However, this behavior changes dramatically with washing and wearing or, in the case of products with high silver load, the electrode surface simply does not survive the washing process. Likewise, silver and steel-based fabrics and embroidery are a no-go for high-quality e-textiles due to their poor quality after washing and wearing. STIM is the only electrode on the market with durable skin impedance and a consistently good feeling on the skin during electrostimulation in sports, even after >100 washing cycles.



Impedance measurements at 1 kHz taken immediately after applying the electrodes, without wetting. Measurements are from a test person with average skin conductivity, no skin treatment, no sweat, on the forearm. Size of all electrodes: 4x4 cm. Washing method: Miele WT1, express program at 30 C, Persil Color Gel liquid detergent, air drying.

High Durability

ElectroSkin STIM is resistant to sweat and prolonged wearing in sports. The wearing test rules out additional potential damage sources like sebum on the skin, UV exposure, detergents, and creams, as well as repetitive friction. The electrodes are electrochemically resistant to continuous stimulation currents during wearing. ElectroSkin STIM has been tested for 300 training units with 30min continuous stimulation each (50 million pulses, 130 mA peak to peak). Over this period, the electrode quality and the stimulation feeling remains stable.

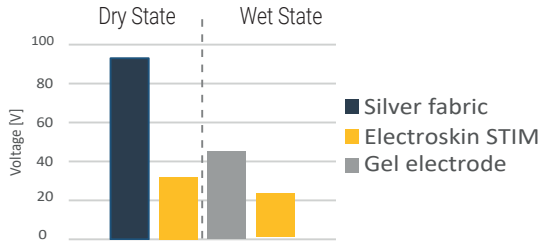
Sweat test ISO 3160-2	passed
Change in skin impedance after 200 hours of continuous wearing	+- 20 %
Change in required voltage for a given stimulation current after 300 units of stimulation	+- 1 %

Good Skin Comformability

High-quality EMS for sports. ElectroSkin STIM is optimized for textile-integrated electrostimulation in sports, without the need for gels or other additional products. The electrodes provide a stable and low-impedance contact for maximum durability and comfort. Thanks to a unique selection of materials, the electrodes are ultra-flexible and provide excellent skin conformation.

Maximal Power Minimal Irritation

For the same stimulation current, ElectroSkin STIM requires a lower voltage than standard silver textile electrodes when applied dry. Silver textile electrodes create an unpleasant stinging sensation when not fully soaked. To a certain degree, this is a challenge for any electrode. With ElectroSkin STIM, stinginess and discomfort during muscle contraction are reduced, making dry electrostimulation a viable alternative (depending on the stimulation protocol applied). Compared to medical gel electrodes, ElectroSkin STIM outperforms them when wet.



Voltage (Vp-p) requirements for a 10mA stimulation current pulse, square wave monophasic, Pulse repetition 20Hz, 50us pulse width. Measurements are from a test person with average skin conductivity, no skin treatment, no sweat, on the quadriceps. Applied with a Digitimer DS7A. Size of all electrodes: 4cm x 4cm.

ElectroSkin Biocompatibility

ISO 10993-5: 2009 (cytotoxicity)	passed
ISO 10993-10:2021 (skin sensitization)	passed
ISO 10993-23:2021 (skin irritation)	passed

Applications

MedTech | Sports | Wellbeing

EMS/FES/NMES

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