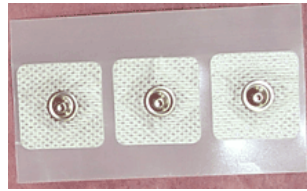
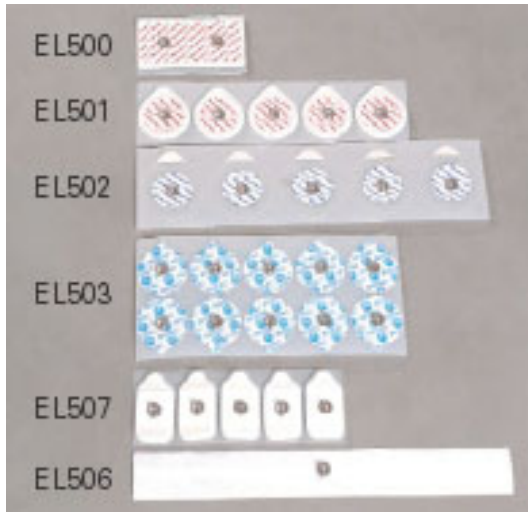


**EL500 SERIES – DISPOSABLE ELECTRODES**



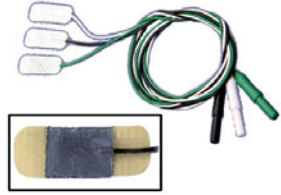
EL504



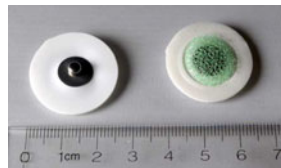
EL509



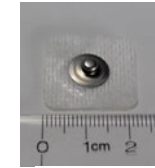
EL508



EL510



EL512



EL513

The EL500 Series disposable, Ag/AgCl snap electrodes provide the same signal transmission as BIOPAC’s reusable electrodes, with added convenience and hygiene. Each peel-and-stick electrode is pre-gelled and designed for one time use only.

Use the EL500 series electrodes with a wide range of BIOPAC electrode leads and cables, such as SS1L, SS1LA, SS2L, SS2LA, SS2LB, LEAD108 series, Lead 110 series, Lead 110S series or any BIOPAC lead or electrode lead cable assembly indicated for use with snap electrodes.

**Electrode Properties – Electrolyte Gel and Chloride Salt Concentration**

For electrode gels (electrolytes), the higher the chloride salt content, the more conductive the electrode. Higher salt content, pre-gelled, surface electrodes are useful for making fast, high quality measurements of biopotentials, once the electrodes are applied to the skin surface. In addition, wet (liquid) gels further accelerate this process because the electrolyte migrates into the skin surface layers more easily and rapidly. High conductivity electrodes generally have reduced artifact, due to the low generated impedance between electrode and skin surface.

As the chloride salt content of the electrolyte drops, the less conductive the electrode. As the chloride content drops to 10% or less, then the electrode can be increasingly employed for long-term recording (greater than 2 hours), with reduced chance for skin irritation. In addition, hydrogels are gentler on the skin than wet (liquid) gels of the same salt concentration. Hydrogel based electrolytes will not migrate into the skin surface as easily or rapidly as with wet gels.

For Electrodermal activity measurements it’s important to use an electrode with similar (isotonic) chloride salt content as per the skin surface, so as not to hypersaturate or hyposaturate the eccrine glands.

The impedance of the electrode/skin junction is highly dependent on the electrolyte type and the chloride salt concentration. For example, a hydrogel electrode with 4% chloride concentration will have about 10x higher impedance than a wet liquid gel electrode with 10% chloride concentration, after first application to the skin.

### Electrode Properties – Backing Adhesive

The 500 series disposable electrodes come with a range of adhesive qualities. All electrodes are designed to adhere well to skin surfaces, but the adhesion characteristics can be grouped depending on the application.

The three adhesive groups are identified as follows:

Group 1: strong adhesive

Group 2: moderate adhesive, high tack

Group 3: moderate adhesive, low tack

Strong adhesive electrodes are best for biopotential measurements when the subject is moving. Moderate adhesive electrodes are optimal for long-term recordings. Lower tack electrodes can be repositioned and are best suited for delicate skin surfaces.

### Usage Descriptions - 500 Series Disposable Ag/AgCl electrodes:

**EL500:** Dual high adhesion, high conductivity, low artifact, biopotential electrodes

**EL501:** High adhesion, high conductivity, low artifact, biopotential electrode

**EL502:** Long-term recording, high adhesion, low artifact, biopotential electrode

**EL503:** General purpose, economical, high conductivity, biopotential electrode

**EL504:** Long-term recording, moderate adhesion, high compliance, low artifact, gentle, biopotential electrode

**EL506:** Bioimpedance, cardiac output use, strip electrode to establish equipotential lines on skin surface

**EL507:** Electrodermal activity measurement electrode\*

**EL508:** MR Conditional electrode for general-purpose use – use only with LEAD108 series leads

**EL509:** MR Conditional electrode for electrodermal activity measurement – use only with LEAD108 series leads

**EL510:** MR Conditional electrode and lead set for general-purpose use

**EL512:** Small (2.54 cm) electrode, easy on the skin for infant applications

**EL513:** Disposable cloth electrode designed for recording EMG or ECG for sleep and facial applications

### Skin Preparation

For highest electrode to skin conductivity, the skin should be lightly abraded with a gentle abrasive wipe, such as BIOPAC's ELPAD\*. An alcohol wipe is not recommended, to improve conductivity, as this will only serve to dry out the skin surface. Lightly abrading the top layer of the epidermis will effectively remove dead skin cells and prepare the skin site to establish a high conductivity path, once the gelled electrode is applied.

After application, the electrode can be verified for robust galvanic connection to the skin via impedance checking. BIOPAC's EL-CHECK can be used to measure the impedance between any two applied surface electrodes. Because each electrode/electrolyte junction forms a half-cell, impedance measurements are more accurately measured at some frequency resident in the band of biopotentials. EL-CHECK operates by injecting a 3.5 uA rms constant current of 25 Hz through the electrodes undergoing impedance check. The complete series impedance loop, including both electrodes/skin junction and coupling body impedance, is reported. Ideally, the reading should be 10,000 ohms or less (approximately 5000 ohms per electrode). In practice, BIOPAC biopotential amplifiers are very tolerant of electrode/skin impedances, even higher than 50,000 ohms. However, the highest quality recordings will always be accompanied by electrode/skin impedance junctions of 10,000 ohms or less.

**\*IMPORTANT: Do not abrade the skin** when using EL507 electrodes for electrodermal activity. [Learn more about EDA Subject Prep.](#)

Electrode Chloride Salt Content and Adhesive Backing

Disposable Electrode Ag/AgCl	Chloride Salt %	Electrode Backing Adhesive
EL500	10% (wet gel)	Strong
EL501	10% (wet gel)	Strong
EL502	4% (hydrogel)	Moderate, high tack
EL503	7% (wet gel)	Moderate, high tack
EL504	4% (hydrogel)	Moderate, low tack
EL506	n/a: dry strip electrode – use any gel	Moderate, low tack
EL507	0.5% (wet gel)	Strong
EL508	10% (wet gel)	Moderate, high tack
EL509	n/a: dry electrode – use any gel	Strong
EL510	4% (hydrogel)	Moderate, low tack
EL512	n/a: dry strip electrode – use GEL 100 or 101	Moderate, low tack
EL513	4% (hydrogel)	Moderate, low tack

Wet (liquid) electrolyte

The chloride salt content in WET gel electrodes from BIOPAC varies:

- 10% is used for short term applications such as resting ECG or stress test
- 7% is a more universal gel and can be used short term for most subjects, though some react long term
- 4% is a long-term, monitoring gel used for more than 24 hours
- 0.5% in electrodermal activity (EDA) electrodes

Hydrogel (solid) electrolyte

The chloride salt content in all hydrogel, solid electrolyte, electrodes from BIOPAC is 4%. This universal gel can be used short and long term, and is suitable for adult and infants.

Duration

BIOPAC does not recommend for applications running more than 24 hours.

Irritation Factors

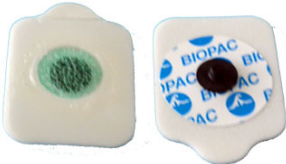

Possible skin irritation can result from the gel or the adhesive on the tape backing of the electrode. To reduce the potential for skin irritation, choose an electrode which has lower electrolyte chloride content, reduced tape backing skin adhesion and electrolyte is hydrogel-based. Overall, the least impactful skin electrodes are the EL504, EL506, EL510, EL512 and EL513.

**Note:** About 2% of the population will react to any adhesives and gels put on a skin, regardless of composition or concentration. Internal body fluids are about 0.9% chloride salt. Skin sweat is typically 0.1% to 0.4% chloride salt.

<b>Part</b>	<i>Ag/AgCl Adhesive/Disposable Electrode Type</i>
<b>EL500</b>  Dual Electrodes	<p>Paired, pre-gelled, electrodes: The fixed spacing between the contacts of these dual electrodes are useful for general-purpose EMG measurements, electrical stimulation, bioimpedance and cardiac output studies. Hypo-allergenic, wet liquid gel electrolyte (10% chloride salt).</p> <p>These electrodes incorporate a gel cavity (16 mm diameter, 1.5 mm deep) situated between electrode and skin surfaces that helps reduce motion artifact.</p> <p>Dual Ag/AgCl electrode conductors: 11 mm diameter, 95 mm<sup>2</sup> conductive contact area, 41 mm spacing (center to center) mounted on 41 mm x 82 mm, moisture resistant, latex free, 1.5 mm thick foam tape with strong adhesive.</p>
<b>EL501</b>  Stress Test Electrodes	<p>Small stress test, pre-gelled, electrodes: Use for short-term recordings where the subject may be in motion or when electrodes should be closely placed, as for multi-channel ECG, EGG, EMG or EOG. Hypo-allergenic wet liquid gel electrolyte (10% chloride salt). These electrodes incorporate a gel cavity (16 mm diameter, 1.5 mm deep) situated between electrode and skin surfaces that helps reduce motion artifact.</p> <p>Single Ag/AgCl electrode conductor: 11 mm diameter, 95 mm<sup>2</sup> conductive contact area, mounted on 40 mm diameter, moisture resistant, latex free, 1.5 mm thick foam tape with strong adhesive.</p>
<b>EL502</b>  Long-term Recording Electrodes	<p>Small, pre-gelled, electrodes. Most appropriate for long-term (&gt; 2 hours) biopotential measurements. Hypo-allergenic, hydrogel, solid, electrolyte (4% chloride salt) that adheres well to skin, but leaves no residue when removed.</p> <p>Single Ag/AgCl electrode conductor: 11 mm diameter, 95 mm<sup>2</sup> conductive contact area mounted on 41 mm diameter, moisture resistant, latex free, vinyl backing tape (0.12 mm thick) with moderately strong adhesive. The hydrogel base also lends these electrodes to electrical stimulation studies, such as for nerve conduction velocity or tDCS.</p>
<b>EL503</b>  <b>General-purpose electrode</b>	<p>Small, pre-gelled, electrodes: These economical electrodes are most suitable for general purpose, short-term recordings. The small diameter permits relatively closely-spaced biopotential recording. Hypo-allergenic wet liquid gel electrolyte (7% chloride salt).</p> <p>Single Ag/AgCl electrode conductor: 11 mm diameter, 95 mm<sup>2</sup> conductive contact area mounted on 35 mm diameter, moisture resistant, latex free, vinyl backing tape (0.12 mm thick) with moderately strong adhesive.</p>
<b>EL504</b>  High Flexibility Electrodes	<p>Small, pre-gelled, electrodes. Most appropriate for long-term (greater than 2 hours) biopotential measurements. Hypo-allergenic, hydrogel, solid, electrolyte (4% chloride salt) that adheres well to skin, but leaves no residue when removed.</p> <p>Single Ag/AgCl electrode conductor: 11 mm diameter, 95 mm<sup>2</sup> conductive contact area mounted on a cloth-based, 2.5 cm x 2.5 cm porous, latex free, backing fabric tape (0.2 mm thick). Particularly useful for applications on non-conforming surfaces, such as the face for EMG or fingers for nerve conduction studies.</p> <p>The electrodes are very comfortable and conform easily to a great variety of skin surfaces. These are optimal electrodes for facial EMG recording, due to gentle adhesion, high flexibility, cloth base and low potential for skin irritation. These electrodes are useful for general ECG, EMG and sleep studies. The hydrogel base also lends these electrodes to electrical stimulation studies, such as for nerve conduction velocity or tDCS. These latex-free, hypo-allergenic, electrodes adhere well to the skin, can be repositioned and are suitable for long term use with minimal irritation.</p>

Part	Ag/AgCl Adhesive/Disposable Electrode Type
<p><b>EL506</b>            Alternative for band electrodes</p>	<p>This unique disposable strip electrode is designed for bioimpedance applications. The electrode is silver laminated on medical grade porous cloth, with industry-standard medical grade adhesive, medium tackiness. The silver/silver chloride (Ag/AgCl) electrode provides accurate and clear transmission of surface biopotentials and is latex free. The Ag/AgCl center, strip conductor is free of electrode gel and is designed for direct connection to the skin surface. If desired, a thin bead of electrode gel (GEL 100) can be added to the surface of the center conductor before application to the skin surface.</p> <p>Strip length: 250 mm, Conductive element width: 6.5 mm, Adhesive width: 2 x 9 mm (9 mm strip on either side of conductive strip,) Cloth backing width: 24.5 mm</p> <p><u>Advantages of the Strip Electrode:</u></p> <ul style="list-style-type: none"> <li>• Combines the convenience of standard snap (spot) electrodes with the signal to noise, equipotential and current diffusion performance of band electrodes</li> <li>• Less obtrusive than band electrodes - easier for subjects to move and breathe</li> <li>• Ergonomic advantages of snap (spot) electrodes</li> <li>• Diffuses currents similarly to band electrodes (reduces current density)</li> <li>• Provides voltage measurements through a well-defined equipotential plane</li> <li>• Adjustable size - cut the 250 mm strip to the desired size for optimal fit</li> <li>• Snap lead connection</li> <li>• Latex free</li> <li>• Peel-and-stick convenience</li> <li>• Disposable</li> </ul>
<p><b>EL507</b>            EDA Electrodes</p>	<p>Designed for electrodermal activity (EDA) measurements and are pre-gelled with isotonic gel. Isotonic gel is recommended for EDA measurements to establish physiological ionic equivalency to the skin surface. The electrodes conform and adhere well to a variety of skin surfaces. Typically, they are applied around fingers to create a firm bond. Also, these electrodes are very suitable for attachment to the palm of hand, wrist, toes or sole of foot. These electrodes incorporate a gel cavity (16 mm diameter, 1.5 mm deep) situated between electrode and skin surfaces that helps to stabilize measurements and reduce motion artifact.</p> <p>Wet Gel: 0.5% chloride salt (isotonic,) Electrode Contact Diameter: 11 mm, Electrode Contact Area: 95 mm<sup>2</sup>, Size: 27 mm x 36 mm, Backing: 1.5 mm thick foam, latex free</p>
<p><b>EL508</b>            MRI General-Purpose Electrodes</p>	<p>These disposable, radio-translucent electrodes are pre-gelled. Use with LEAD108 series.</p> <p><b>MRI Use:</b> MR Conditional</p> <p><b>Condition:</b> Up to 7T, any scanning sequence. Up to 9T on animals. Use with LEAD108 series only.</p> <p>Electrode contact type: Ag/AgCl laminated on carbon composition plastic snap, Wet Gel: 10% chloride salt, Electrode Contact Diameter: 11 mm, Electrode Contact Area: 95 mm<sup>2</sup>, Vinyl Tape Backing: 41 mm diameter, 0.12 mm thick, latex free</p> <p><b>EL508 Components:</b> Substrate: Tape with medical grade adhesive, Label: Bi-Oriented Polypropylene (BOPP) or Vinyl, Stud: 40% Carbon-filled ABS plastic, Eyelet: 20% glass-filled ABS plastic coated with Ag/AgCl, Reticulated foam: Polyester-polyurethane, Gel: 10% chloride salt wet liquid gel electrolyte</p>



Part	Ag/AgCl Adhesive/Disposable Electrode Type
<p><b>EL509</b></p> <p>MRI EDA Electrodes</p>	<p>These disposable, radio-translucent, dry electrodes have a very long shelf-life and are ideal for electrodermal activity (EDA) measurements. They are content and dimensionally equivalent to the EL507 series electrodes, but with carbon composition snap and gel-free. Use with LEAD108 and isotonic electrode gel - GEL101 recommended for EDA.</p> <p>Isotonic gel is recommended for EDA measurements to establish physiological ionic equivalency to the skin surface. The electrodes conform and adhere well to a variety of skin surfaces. Typically, they are applied around fingers to create a firm bond. Also, these electrodes are very suitable for attachment to the palm of hand, wrist, toes or sole of foot. These electrodes incorporate a gel cavity (16 mm diameter, 1.5 mm deep) situated between electrode and skin surfaces that helps to stabilize measurements and reduce motion artifact.</p> <p><b>MRI Use:</b>        <b>MR Conditional</b></p> <p><b>Condition:</b>      Up to 7T, any scanning sequence. Up to 9T on animals. Use with LEAD108 series only.</p> <p>Electrode contact type: Ag/AgCl laminated on carbon composition plastic snap, Electrode Contact Diameter: 11 mm, Electrode Contact Area: 95 mm<sup>2</sup>, Size: 27 mm x 36 mm, Backing: 1.5 mm thick foam, latex free</p> <p>To add gel:</p> <ol style="list-style-type: none"> <li>1. Fill back cavity (adhesive side) with gel.</li> <li>2. Add a drop of gel to the sponge pad.</li> <li>3. Place the sponge pad into the cavity.</li> <li>4. Press firmly to clear air pockets.</li> </ol>  <p><b>EL509 Components:</b> Substrate: Tape with medical grade adhesive, Label: Bi-Oriented Polypropylene (BOPP) or Vinyl, Stud: 40% Carbon-filled ABS plastic, Eyelet: 20% glass-filled ABS plastic coated with Ag/AgCl, Reticulated foam: Polyester-polyurethane, Gel: none; add BIOPAC GEL101 at time of application.</p>
<p><b>EL510</b></p> <p>MRI X-ray Electrodes</p>	<p>EL510 is a disposable, radio-translucent, set of three electrodes with hydrogel (4% chloride salt) electrolyte centers and hydrocolloid ends that terminate in 1.5 mm Touchproof leads. Each box includes 20 sets of 3 electrodes. Electrodes are 25 mm x 10 mm with a 10 mm x 10 mm, gelled, contact area. The thin, flexible, carbon composition leads are 58 cm long.</p> <p><b>MRI Use:</b>        <b>MR Conditional</b></p> <p><b>Condition:</b>      Tested up to 3T, any scanning sequence, radiolucent head</p> <ul style="list-style-type: none"> <li>• Pre-wired, carbon composition leads</li> <li>• Ag/AgCl contact type</li> <li>• Safely secures to limbs without a strap that could reduce circulation.</li> <li>• Gentle hydrogel centers and hydrocolloid ends adhesives</li> <li>• Long lasting and easy to use, even under high humidity</li> <li>• Radio-translucent materials allow for X-ray passage</li> <li>• Latex, phthalate/DEHP, BPA free</li> </ul> 

Part	<i>Ag/AgCl Adhesive/Disposable Electrode Type</i>
<b>EL512</b>  Disposable Dry Infant Electrode	Small round dry electrode (2.54 cm; 1") that is easy on the skin for infant applications. Add gel before recording, such as GEL100 or GEL101. Foam backing with standard snap for lead connection; use with any pinch lead connector, such as LEAD110 series, LEAD108, or BN-LEAD series.  Available in packs of 100 (order EL512) or 1000 (order EL512-10).
<b>EL513</b>  Disposable Cloth Facial Electrode	Disposable cloth electrodes designed for recording EMG or ECG for sleep and facial applications. <ul style="list-style-type: none"> <li>• 10 mm contact area on 2 cm x 2 cm backing</li> <li>• Front has standard snap for lead connection (Use with LEAD110 or BN-LEAD series)</li> <li>• Back has conductive adhesive solid gel that tolerates repositioning for proper placement</li> </ul> The non-woven cloth base of the electrode is extremely conforming to contours of the face and very comfortable.  Available packs of 60 (order EL513) or 600 (order EL513-10).