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EL500 SERIES – DISPOSABLE ELECTRODES

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: Strip electrodes discontinued in December 2018. Replaced with EL516 or EL526.

EL507A: Dry Electrodermal activity (EDA) 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

EL516: Disposable carbon film strip electrodes, high conductivity, bioimpedance electrode

EL526: MR Conditional electrode for bioimpedance – MR Conditional only with MECMRI Extension Cables

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 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.

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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.

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 EL507A electrodes for electrodermal activity. Learn more about EDA Subject Prep.

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Electrode Chloride Salt Content and Adhesive Backing

Disposable Electrode Ag/AgCi	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
EL507A	n/a: dry electrode – use GEL101A	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 GEL100 or 101A	Moderate, low tack
EL513	4% (hydrogel)	Moderate, low tack
EL516	4% (hydrogel)	Moderate, low tack
EL526	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, 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.

PART	Electrode Description
EL500 Dual Electrodes	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).  These electrodes incorporate a gel cavity (16 mm diameter, 1.5 mm deep) situated between electrode and skin surfaces that helps reduce motion artifact. Dual Ag/AgCl electrode conductors: 11 mm diameter, 95 mm^2 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.
EL501 Stress Test Electrodes	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. Single Ag/AgCl electrode conductor: 11 mm diameter, 95 mm^2 conductive contact area, mounted on 40 mm diameter, moisture resistant, latex free, 1.5 mm thick foam tape with strong adhesive.
EL502 Long-term Recording Electrodes	Small, pre-gelled, electrodes. Most appropriate for long-term (> 2 hours) biopotential measurements. Hypo-allergenic, hydrogel, solid, electrolyte (4% chloride salt) that adheres well to skin, but leaves no residue when removed.  Single Ag/AgCl electrode conductor: 11 mm diameter, 95 mm^2 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.
EL503 **General-purpose electrode**	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 liquid gel electrolyte (7% chloride salt).  Single Ag/AgCl electrode conductor: 11 mm diameter, mm^2 conductive contact area mounted on 35 mm diameter, moisture resistant, latex free, vinyl backing (0.12 mm thick) with moderately strong adhesive. wet 95 tape

PART	Electrode Description
EL504 High Flexibility Electrodes	 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. Single Ag/AgCl electrode conductor: 11 mm diameter, 95 mm^2 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. 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.
EL507A Dry EDA Electrodes	 These dry electrodes are designed for electrodermal activity (EDA) measurements. Application of GEL101A isotonic gel is required 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. **GEL101A** (available separately): 0.5% saline (isotonic) in a neutral base, 0.05 molar NaCl **Electrode Contact Diameter:** 11 mm **Electrode Contact Area:** 95 mm^2; **Size:** 27 mm x 36 mm; **Backing:** 1.5 mm thick foam, latex-free
EL508 MRI General-Purpose Electrodes	 These disposable, radio-translucent electrodes are pre-gelled. Use with LEAD108 series. ***MRI Use:*** MR Conditional ***Condition:*** Up to 7T, any scanning sequence. Up to 9T on animals. Use with LEAD108 series only. 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^2, Vinyl Tape Backing: 41 mm diameter, 0.12 mm thick, latex free ***EL508 Components:*** 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

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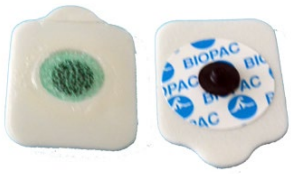
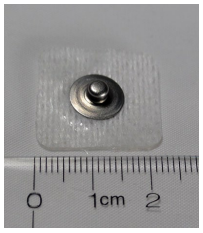
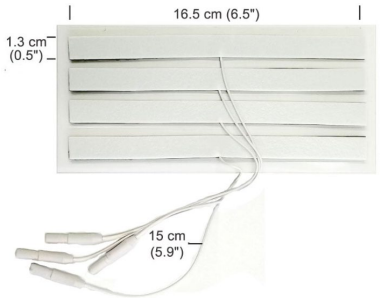
PART	Electrode Description
EL509 MRI EDA Electrodes	These disposable, radio-translucent, dry electrodes have a very long shelf-life and are ideal for electrodermal activity (EDA) measurements. They are content and dimensionally equivalent to the EL507A series electrodes, but with carbon composition snap and gel-free. Use with LEAD108 and isotonic electrode gel - GEL101A recommended for EDA. 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. ***MRI Use:*** MR Conditional ***Condition:*** Up to 7T, any scanning sequence. Up to 9T on animals. Use with LEAD108 series only. Electrode contact type: Ag/AgCl laminated on carbon composition plastic snap, Electrode Contact Diameter: 11 mm, Electrode Contact Area: 95 mm^2, Size: 27 mm x 36 mm, Backing: 1.5 mm thick foam, latex free To add gel: 1. Fill back cavity (adhesive side) with gel. 2. Add a drop of gel to the sponge pad. 3. Place the sponge pad into the cavity. 4. Press firmly to clear air pockets.  ***EL509 Components:*** 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 GEL101A at time of application.
EL510 MRI X-ray Electrodes	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. ***MRI Use:*** MR Conditional ***Condition:*** Tested up to 3T, any scanning sequence, radiolucent head • Pre-wired, carbon composition leads • Ag/AgCl contact type • Safely secures to limbs without a strap that could reduce circulation. • Gentle hydrogel centers and hydrocolloid ends adhesives • Long lasting and easy to use, even under high humidity  • Radio-translucent materials allow for X-ray passage • Latex, phthalate/DEHP, BPA free

PART	Electrode Description
EL512 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 GEL101A. 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). 
EL513 Disposable Cloth Facial Electrode	Disposable cloth electrodes designed for recording EMG or ECG for sleep and facial applications. • 10 mm contact area on 2 cm x 2 cm backing • Front has standard snap for lead connection (Use with LEAD110 or BN-LEAD series) • Back has conductive adhesive solid gel that tolerates repositioning for proper placement  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).
EL516 Disposable Strip Electrodes	Pack of four carbon film strip electrodes (10 cm; 4” x 1.3 cm; 0.5”) with fabric backing for comfort & conformity and snap fit for BIOPAC electrode leads. Add hydrogel before recording for a conductive medium. Available in packs of 4 (order EL516) or 80 (order EL516-20). 
EL526 Bioimpedance Strip Electrodes	Pack of four strip electrodes with TP leads attached, intended for bioimpedance applications. Each electrode is 16.5 cm x 1.3 cm (6.5″ x 0.5″) with four 15 cm lead cables that terminate in 1.5 mm Touch Proof sockets. The electrode is foam backed and uses hydrogel to adhere the electrode to the participant and provide a conductive medium. The electrode is carbon fiber with carbon fiber electrode leads and is considered MR Conditional when used with MECMRI series MRI Extension Cables.  To use with NICO100D for TREV measurements, add CBL246 NICO100D 4-pin to 4xTP male. Cannot be used with LEAD108 leads. ***MRI Use:*** MR Conditional ***Condition:*** Use with MECMRI series MRI Extension Cables.