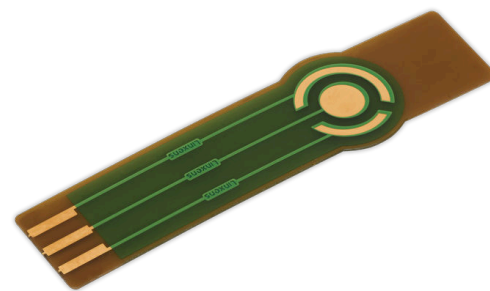


Linxens Uniflex™ Gold



The first R2R electroplated gold transducer platform with a Flex architecture, offering a simplified interface, stable metal-layer performance, and highly reproducible signal quality.

1. Intended Purpose

Linxens UniFlex™ Gold is a laboratory transducer designed exclusively for in vitro research purposes. It is not intended for clinical use, diagnostic, therapeutic or commercial measurement applications of any kind. Linxens provides no warranty or guarantee beyond the scope of the product and/or outside the specifications of use described herein. Non-respect of these provisions is at the sole responsibility of the user.

2. Product Description

Linxens UniFlex™ Gold is a uniplex, gold electroplated transducer. It is composed of 5 layers, as visualized in Figure 1.

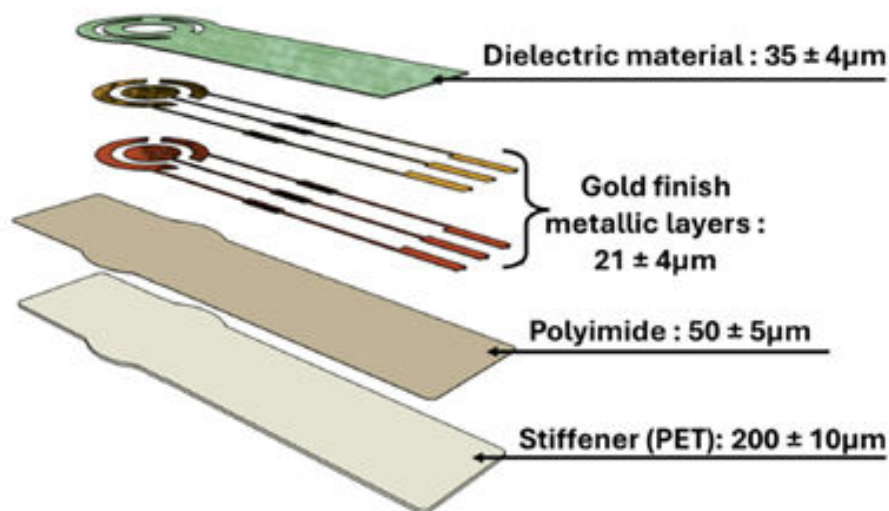


Figure 1 – Linxens UniFlex™ Gold: Exploded View

3. Technical Specifications

- Dimensions : L35 x W10 x H0.31mm
- Working Electrodes (WE): Gold (area = 1.77 mm²)
- Auxiliary/Counter Electrode (CE): Gold (area = 3.53 mm²)
- Reference Electrode (RE): Gold (area = 0.50 mm²)

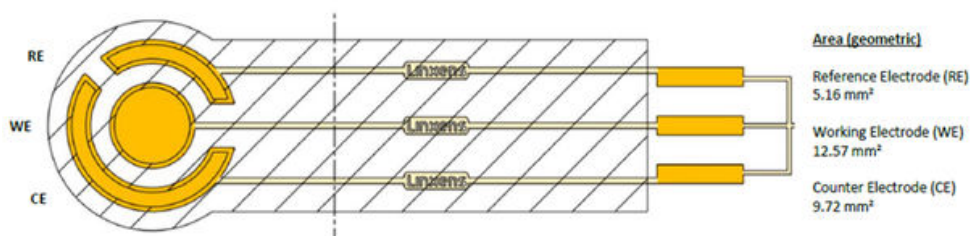


Figure 2 – Linxens UniFlex™ Gold: Drawing

4. Delivery Format

Linxens UniFlex™ Gold is supplied in:

- Reels of 100 pre-singulated units, featuring up to 110 transducer positions: 100 functional positions and up to 10 empty positions. Maximum number of splices per roll: 2 or;
- Reels of 500 pre-singulated units, featuring up to 530 transducer positions: 500 functional positions and up to 30 empty positions. Maximum number of splices per roll: 7

5. Storage & Shelf Life

To ensure long-term durability, Linxens UniFlex™ Gold should be adequately protected — ideally stored under vacuum, or alternatively in a hermetically sealed container. Storage conditions must be controlled, with particular attention to maintaining room temperature and a low-humidity environment. Under these conditions, Linxens UniFlex™ Gold has an estimated shelf life of approximately one year.

6. Instructions for Use

Cleaning procedure/surface preparation:

It is recommended to initially assess Linxens UniFlex™ Gold without cleaning. If necessary, you can use a cyclic voltammetry cleaning procedure in H₂SO₄ at 50 mM (5 cycles from -1V to 1.3V vs. Au) and we highly recommend employing an external reference and counter electrode (commercial Ag/AgCl and a platinum wire for example) for this operation to avoid the shift of the potential value (in this case: 5 cycles from -0.8V to 1.5V vs. Ag/AgCl).

The contact between the electrode and organic solvents such as ethanol must be strictly avoided, as well as exposure to ultrasonic cleaning.

Operating conditions:

Important Information

- For optimal performance, operate Linxens UniFlex™ Gold in a horizontal position on a flat and stable surface.
- Before starting any electrochemical measurement, verify that all electrodes are fully immersed in or covered by the test solution.

Improper setup may result in reduced transducer performance.

For specific requirements, including reagent deposition, custom geometries, solvent compatibility, selective electrode plating and long-term applications, feel free to contact us for customized solutions.

7. Electrochemical Properties

Chemicals

Phosphate Buffer Saline (PBS) tablets (10 mM $\text{HPO}_4^{2-}/\text{H}_2\text{PO}_4^-$, 137 mM sodium chloride; 2.7 mM potassium chloride; pH 7.4), Phosphate Buffer (PB, 8.3 mM), Ferrocene methanol, Potassium Ferricyanide and Ferrocyanide ($\text{K}_3[\text{Fe}(\text{CN})_6] + \text{K}_4[\text{Fe}(\text{CN})_6]$), Potassium chloride (KCl), Sulfuric acid (H_2SO_4), potassium nitrate (KNO_3), hydrochloric acid (HCl), nitric acid (HNO_3), sodium hydroxide (NaOH) were purchased from Sigma Aldrich (Merck, lab grade) and used without further modification.

Experimental section

Electrochemical measurements (cyclic voltammetry and impedance) were performed by using a Palmsens potentiostat: Palmsens 4.

They were carried out at room temperature on a Linxens UniFlex™ Gold transducer. Accordingly, the reference and counter electrodes were gold electrodes. All data were recorded using a Linxens UniFlex™ Gold transducer from the shelf, without any cleaning procedure.

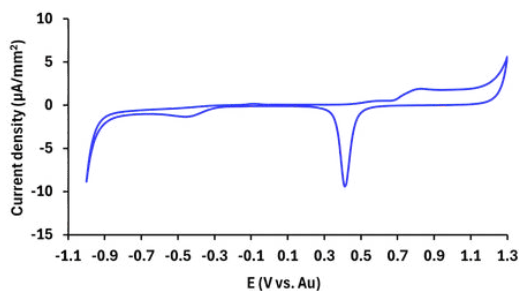
The results are provided with a confidence level of 80%.

Electrochemical results

Parameters Scan rate = 100 mV.s⁻¹
Temperature = 22 ± 2°C

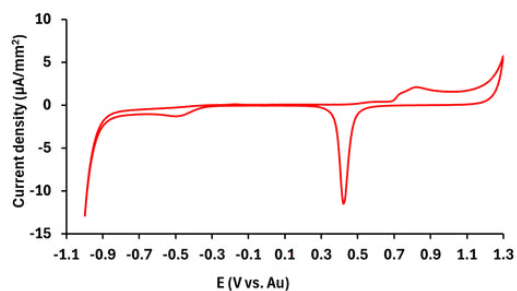
Electrochemical response in different mediums at different pH (acid, neutral and alkaline)

Sulfuric acid H₂SO₄ | (50 mM) | pH = 1.6



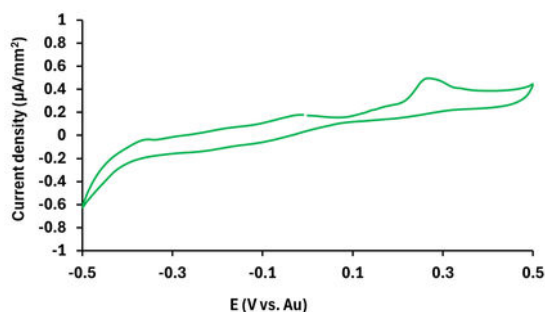
In sulfuric acid at 50 mM, cyclic voltammetry can be carried out within a potential window ranging from -1V to 1.3V. Beyond this range, water oxidation and reduction are observed.

Sulfuric acid H₂SO₄ | (1 mM) | pH = 0.8



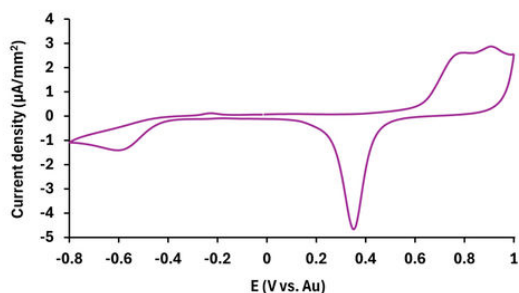
In sulfuric acid at 1 mM, cyclic voltammetry can be carried out within a potential window ranging from -1V to 1.3V. Beyond this range, water oxidation and reduction are observed.

Hydrochloric acid HCl | (50 mM) | pH = 1.7



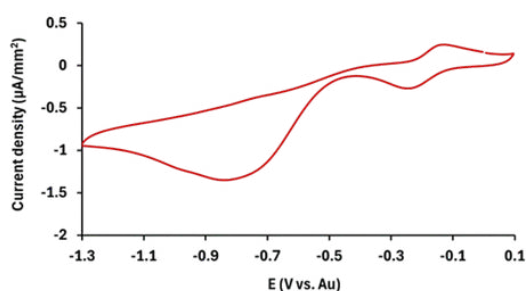
The presence of chloride ions in the solution accelerates the degradation of the electrode (localized corrosion), which forces us to operate within a reduced potential window. The cyclic voltammetry curve in HCl shows an unfamiliar behavior of Linxens UniFlex™ Gold, but this step does not degrade the Linxens UniFlex™ Gold's performance when it is later used in a different medium.

Nitric acid HNO₃ | (50 mM) | pH = 1.06



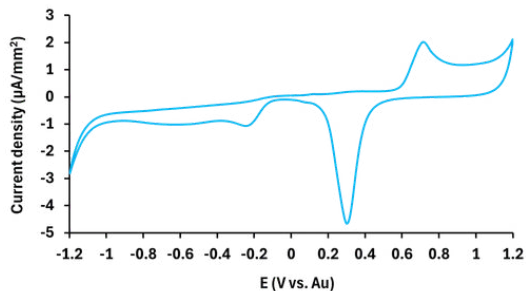
In nitric acid, cyclic voltammetry can be performed between -0.8V and 1V.

Potassium Chloride KCl (0.1M) | pH = 5.8



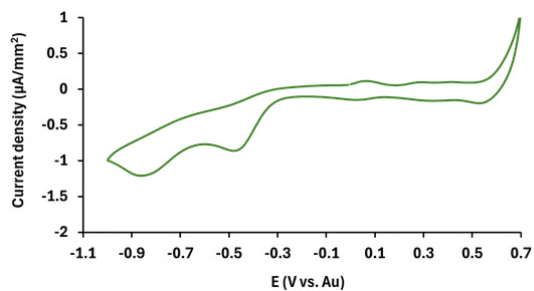
Due to the high concentration of chloride ions in potassium chloride, the electrochemical potential window is restricted.

Phosphate Buffer | (10 mM) | pH = 7.07

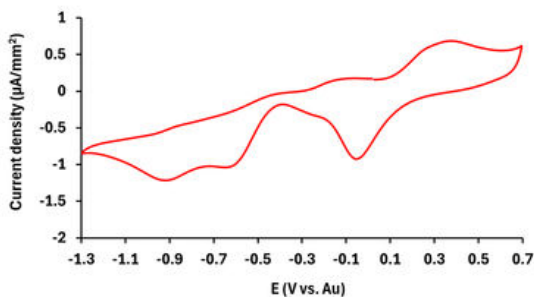


In a phosphate buffer without chloride ion, the electrochemical potential window is extended, enabling measurements within a range of -1.2V to 1.2V.

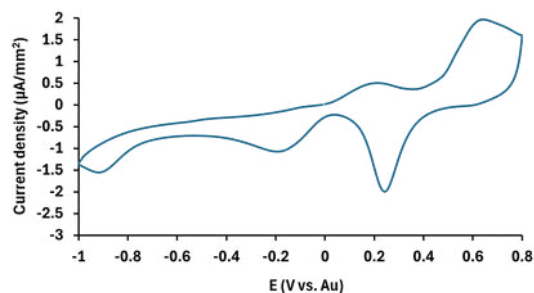
Phosphate Buffer Saline | (10 mM) | pH = 7.52



The elevated chloride ion concentration in PBS (approximately 140 mM) poses a limitation on the use of high anodic potentials, due to the potential for electrode corrosion or degradation.

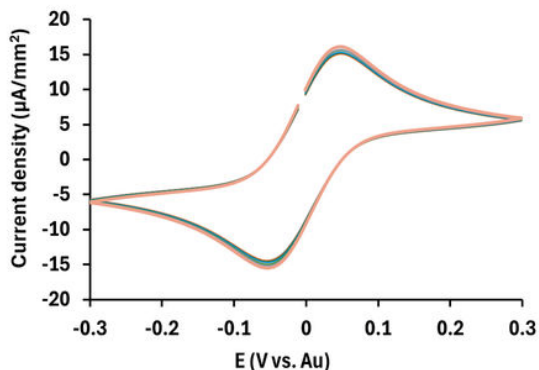
Potassium Nitrate KNO_3 (0.1 M) | pH = 4.2

In KNO_3 , the potential window in which cyclic voltammetry can be performed is between -1.3V and 0.7V.

Sodium hydroxide NaOH | (0.1 M) | pH = 12.9

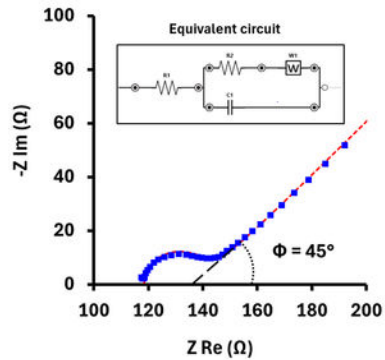
In NaOH , cyclic voltammetry can be carried out between -1V and 0.8V.

Electrochemical response in the presence of an analyte

Cyclic voltammetry in $[\text{K}_3[\text{Fe}(\text{CN})_6]] + [\text{K}_4[\text{Fe}(\text{CN})_6]]$ solution (5 mM in PBS 10 mM)

- These results obtained from experiments conducted on multiple samples demonstrate the reproducibility of Linxens UniFlex™ Gold's response. Consistent current intensities and identical potential values for both the reduction and oxidation peaks were obtained. The coefficient of variation of the current intensity is around 1.5% between cycles for the same transducer and below 3% between transducer batches.
- The redox potentials between different electrodes remain constant for a given redox couple ($\text{K}_3[\text{Fe}(\text{CN})_6]/\text{K}_4[\text{Fe}(\text{CN})_6]$ in our case) under fixed conditions: same scan rate and same reference electrode.

Electrochemical impedance spectroscopy (EIS):
A comparison between experimental impedance data and theoretical simulation in $[K_3[Fe(CN)_6]] + [K_4[Fe(CN)_6]]$ solution (5 mM in PBS 10 mM)

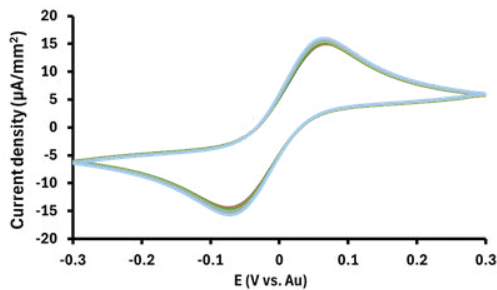


- The results indicate a good agreement between the experimental data (blue) and simulation results (red) according to the attached equivalent circuit using.
- The values of charge transfer resistance that are generally observed are below 50Ω.

It is important to note that in chronoamperometry, a high potential cannot be applied for an extended period, especially in Cl^- containing solutions. For experiments lasting several minutes, such as in PBS, the potential should be limited to 0.3V.

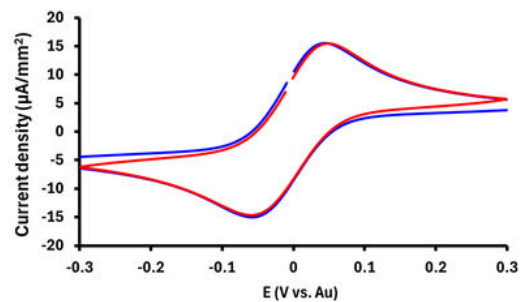
Reproducibility and durability

Reproducibility: Cyclic voltammetry in $[K_3[Fe(CN)_6]] + [K_4[Fe(CN)_6]]$ solution (5 mM in PBS 10 mM)



These results were obtained from experiments conducted on different Linxens UniFlex™ Gold transducers from two separate batches, and the results show good reproducibility, as confirmed by a coefficient of variation around 2.5%.

Durability: Cyclic voltammetry in $[K_3[Fe(CN)_6]] + [K_4[Fe(CN)_6]]$ solution (5 mM in PBS 10 mM)



The results demonstrate that the Linxens UniFlex™ Gold transducers exhibit consistent electrochemical responses on Day 0 (Blue) and after one year (red), indicating long-term stability and no significant degradation over time.

8. About Linxens Healthcare

Linxens Healthcare designs, develops, and manufactures innovative functional printed and converted solutions, enabling the next generation of biosensors, stick-to-skin wearables, and track-and-trace technologies. With more than 550 million units delivered globally, Linxens Healthcare is among the largest suppliers of biosensors in the world. As a Contract Design and Manufacturing Organization (CDMO), we support the full product lifecycle, from early-stage design and prototyping to high-volume roll-to-roll mass production. Linxens operates seven R&D centers and eight manufacturing sites worldwide, including four ISO 13485-certified facilities and one FDA-registered site, with clean-room manufacturing capabilities up to Class 7.

Linxens advantages at a glance:

- 40+ years of leadership in printed electronics
- Trusted biosensor partner with over 500 million units delivered globally
- End-to-end customization, from concept to industrialization
- Scalable roll-to-roll (R2R) manufacturing built for volume and speed
- Global production network with eight industrial sites worldwide
- Advanced manufacturing environment with clean rooms up to Class 7
- ISO 13485-certified operations ensuring medical-grade quality
- FDA-registered manufacturing site
- Strong RAQA expertise

Biosensor Customization Capabilities:

- Constructions (e.g. single-sided, double-sided, well)
- Shapes (e.g. 2-3 electrodes, interdigitated, multi-array)
- Substrates (e.g. glass epoxy, polyimide, PET)
- Plating finish (e.g. gold, platinum, palladium, silver)
- Coverlay (e.g. soldermask)
- Surface functionalization (e.g. silver/silver chloride, conductive polymers)



healthcare.linxens.com

Visit our website to discover
our offers and get in touch with us!

For any queries, please contact us at:
healthcare@linxens.com