

Catalogue 2018



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THINK & INNOVATE

Smart Microfluidic and Electrochemical Solutions for Research Science

Last update: February 2018



» Presentation

MicruX Technologies is an innovative technology-based company expertise in electrochemistry and microfluidic platforms, founded in 2008 and based in Oviedo (Asturias), SPAIN.

MicruX develops miniaturized, automated and portable analysis systems. Thus, **Lab-on-a-Chip** (LOC) technologies based on **microfluidics** and **electrochemical sensors** give rise to the integration of multiple steps carried out in a laboratory (sample pretreatment, mixing, reaction, separation, and detection) on a single device. These **miniaturized devices** enable the separation, detection, identification and quantification of compounds with analytical interest in real samples. Thus, these novel devices can be used at **research** and **industrial level** for developing innovative solutions in food, environment and health sector.



MicruX is proficient in **microfluidics** and **electrochemical** detection systems especially designed for research and educational activities. In microfluidic field, MicruX has extensive experience in developing, manufacturing and application of **microfluidic electrophoresis chips**. Moreover, our know-how in the electrochemistry field, allow us the design and integration of miniaturized **electrochemical sensors** on a simple and cost-effective way.

MicruX also provides a new generation of **analytical instrumentation** in order to make easier the use of the microfluidic and electrochemical devices. Moreover, MicruX has the know-how to provide **services** for achieving food, environmental and clinical applications using these novel **microfluidic** and **electrochemical devices**.

MicruX contributes to make the use of **microfluidic** and **electrochemical** devices more routinary in different research fields as well as in industry.

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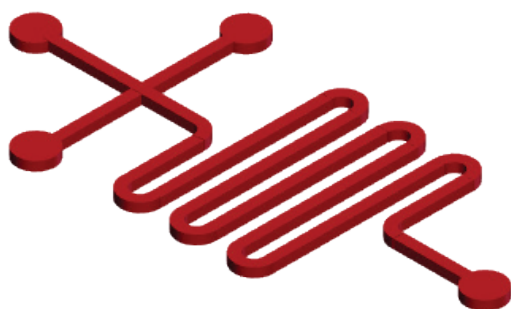
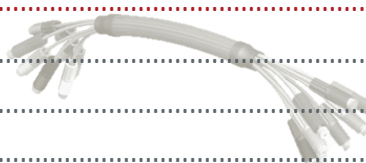
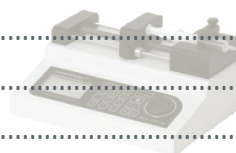
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1. ELECTROCHEMICAL SOLUTIONS

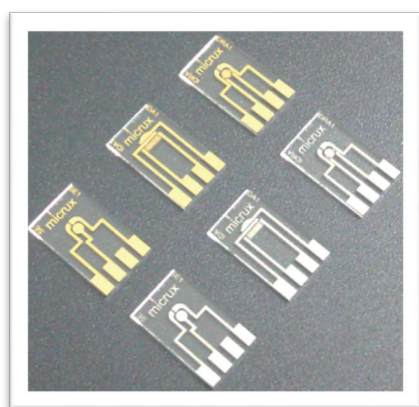


MicruX develops a wide range of standard and customized *thin-film (microe)electrodes* as well as related user-friendly *accessories*. The thin-film electrochemical sensors provide a cost-effective and useful tool for electroanalytical applications, including the development of (bio)sensors.

1.1. ELECTROCHEMICAL SENSORS

MicruX develops **metal-based (micro)electrodes** fabricated by thin-film technologies on a Glass substrate. A SU-8 resin protective layer is used to delimit the electrochemical cell enabling the use of very small sample volume.

» Thin-film electrodes main features



» Standard dimensions:	10 x 6 x 0.75 mm
» Substrate:	Glass
» Protective layer:	SU-8 resin
» Electrochemical cell:	2 or 3.5 mm Ø
» Sample volume:	1 – 10 µL
» Electrode material:	Platinum or Gold

The inherent properties of the **thin-film (micro)electrodes** such as low cost & disposables, reusable, high fabrication resolution, high sensitivity, low reagent consumption as well as non-tedious pre-cleaning procedures provide a suitable tool for **multiple applications**.

Electroanalysis	Flow Systems & Microfluidics	Nanotechnology	Biosensors
<ul style="list-style-type: none"> ✓ Study EC reactions ✓ Trace EC Analysis ✓ In-vivo measurements ✓ Redox cycling 	<ul style="list-style-type: none"> ✓ FIA Systems ✓ Microchips Electrophoresis ✓ Capillary Electrophoresis ✓ HPLC 	<ul style="list-style-type: none"> ✓ Modified electrodes ✓ New nanostructures ✓ New nanomaterials 	<ul style="list-style-type: none"> ✓ EC transducers ✓ New recognition elements ✓ POC systems

Electrochemical sensors are available in different standard designs and materials.

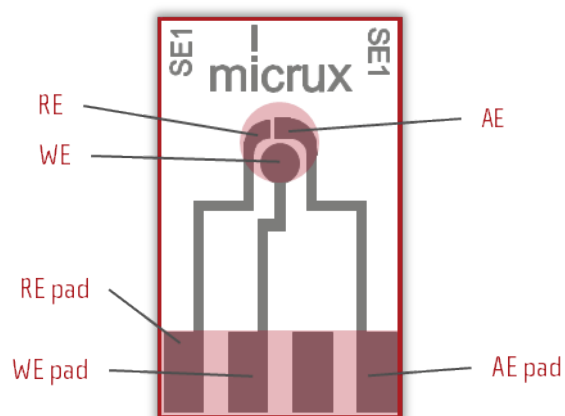
*Thin-film technologies can be also used for the manufacture of **customized electrochemical sensors**. MicruX has wide experience in the design and development of different thin-film based electrodes. Thus, the (micro)electrodes are adapted to fulfill the requirements of customers.*

1.1.1. Thin-film single-electrodes (SE)

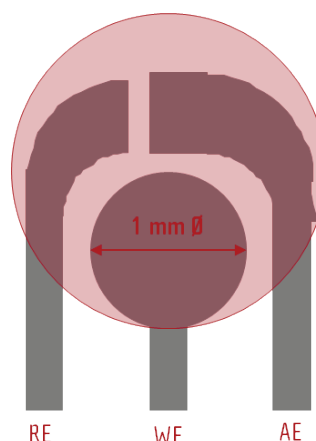
» Thin-film platinum & gold single-electrodes

Electrochemical sensors SE are based on a three-electrode (working - WE, reference - RE and auxiliary - AE) approach. The three electrodes are fabricated in the same material (*platinum* or *gold*) with high precision and resolution.

» Electrochemical SE sensor design

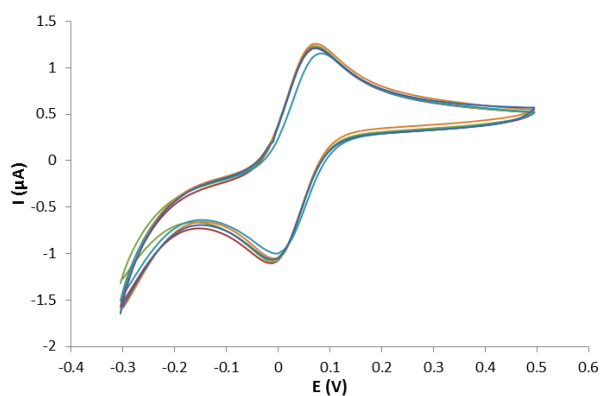


» Electrochemical cell (2 mm Ø)

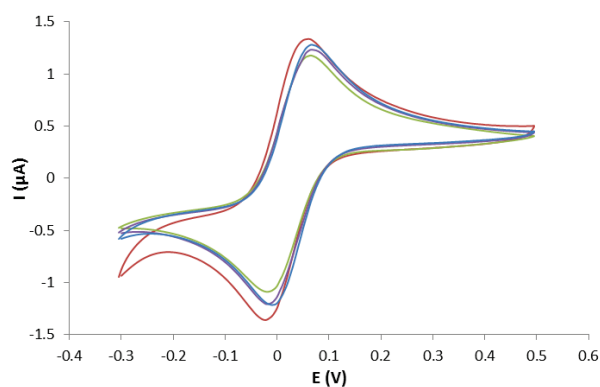


Reference	Electrodes Material	WE size	Electrodes thickness
» ED-SE1-Pt	Titanium / Platinum	1mm diameter	50/150 nm
» ED-SE1-Au	Titanium / Gold	1mm diameter	50/150 nm

Thin-film metal-based electrodes show an excellent electrochemical behavior with a good intra- and inter-electrode reproducibility.



Cyclic voltammograms for 1 mM $K_4Fe(CN)_6$ in 0.1 M KCl at **different** thin-film Pt electrodes (ED-SE1-Pt). $v = 50$ mV/s, $n = 5$, **RSD = 4%**



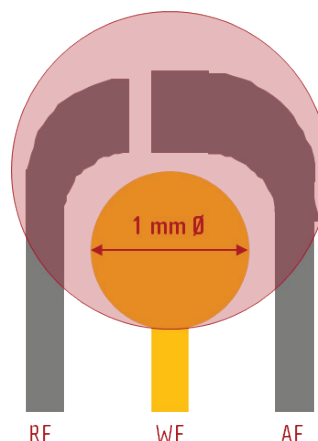
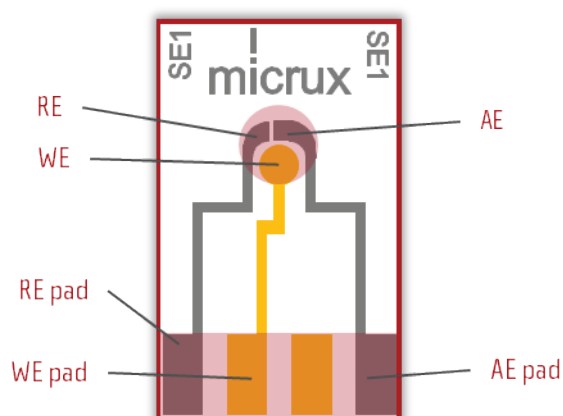
Cyclic voltammograms for 1 mM ferrocenylmethyl alcohol in 0.05 M H_2SO_4 at **different** thin-film Au electrodes (ED-SE1-Au). $v = 50$ mV/s, $n = 4$, **RSD = 6%**

» Thin-film double-metal single-electrodes

Double-metal thin-film electrochemical sensors are based on a three-electrodes approach with a *gold* working electrode (WE) and *platinum* reference (RE) and auxiliary (AE) electrodes. The combination of **two different metal electrodes** in the same EC cell enables the *modification* of the working electrode surface selectively without affecting the surface of the reference and auxiliary electrodes.

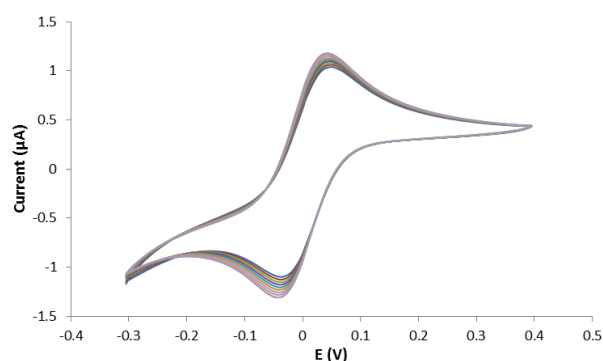
» Electrochemical double-metal SE sensor design

» Electrochemical cell (2 mm Ø)

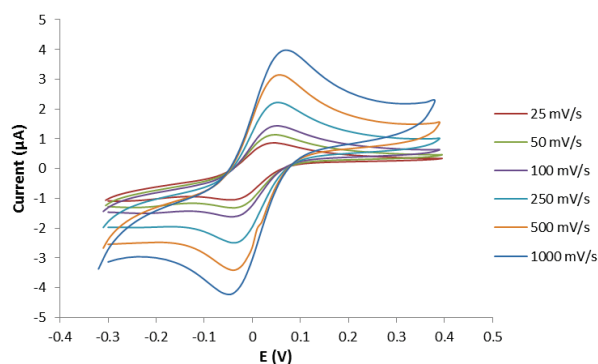


Reference	WE	Electrodes Material		WE size	Electrodes thickness
		RE	AE		
» ED-SE1-AuPt	Ti / Au	Ti / Pt	Ti / Pt	1mm diameter	50/150 nm

Thin-film double-metal electrodes show an excellent electrochemical behavior with a good reproducibility.



Successive cyclic voltammograms for 1 mM $K_4Fe(CN)_6$ in 0.1 M KCl at the **same** thin-film Au electrode (ED-SE1-AuPt). $v = 50$ mV/s, $n = 10$, **RSD = 3%**



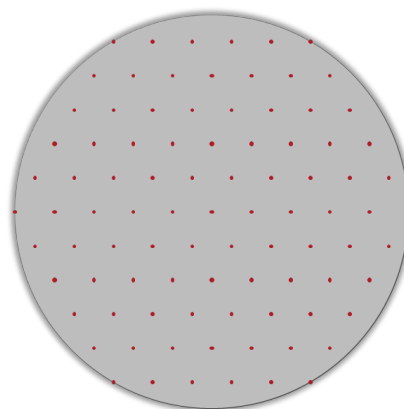
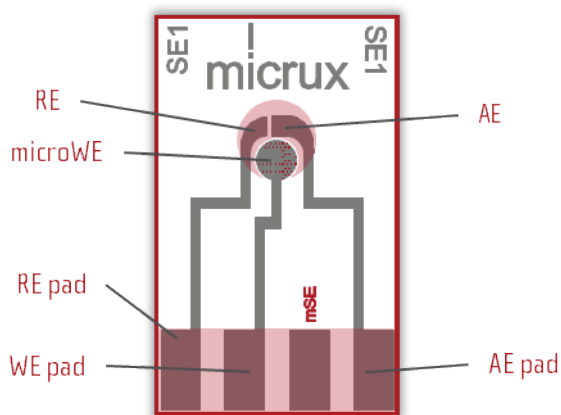
Cyclic voltammograms for 1 mM $K_4Fe(CN)_6$ in 0.1 M KCl using different **scan rates** at a thin-film Au electrode (ED-SE1-AuPt).

1.1.2. Thin-film microelectrode arrays (MEA)

Thin-film technologies enable the development of small microstructures (<25 μm) with high resolution and precision. Thus, a **microelectrode array** (MEA) based on **pinholes** with a honeycomb microstructure can be manufactured on a working single-electrode.

» Electrochemical mSE sensor design

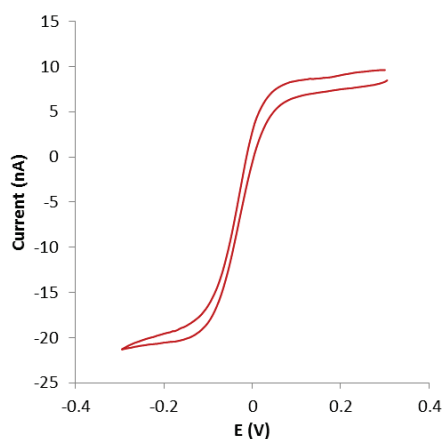
» Electrochemical cell – Working Microelectrode Array



The working electrode (1 mm diameter) is based on a metal surface coated with SU-8 resin in which is defined a **microholes array** with **honeycomb structure**.

Reference	Electrodes Material	Working Electrode Microstructure			Electrodes thickness
		μHoles diameter	μHoles pitch	μHoles number	
» ED-mSE-5-Pt	Ti / Pt	5 μm	50 μm	500	50/150 nm
» ED-mSE-10-Pt	Ti / Pt	10 μm	100 μm	90	50/150 nm
» ED-mSE-5-Au	Ti / Au	5 μm	50 μm	500	50/150 nm
» ED-mSE-10-Au	Ti / Au	10 μm	100 μm	90	50/150 nm

Thin-film **MEA** electrodes show the typical **microelectrode behavior** to enhance the analytical signals by reaching the **steady-state** in a short time.



Cyclic voltammogram for 1 mM ferrocenylmethyl alcohol in 0.1 M H_2SO_4 at a thin-film **gold** microelectrode array (ED-mSE-10-Au). $v = 10 \text{ mV/s}$.

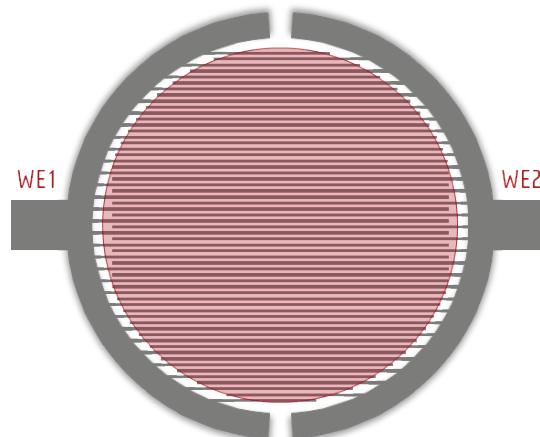
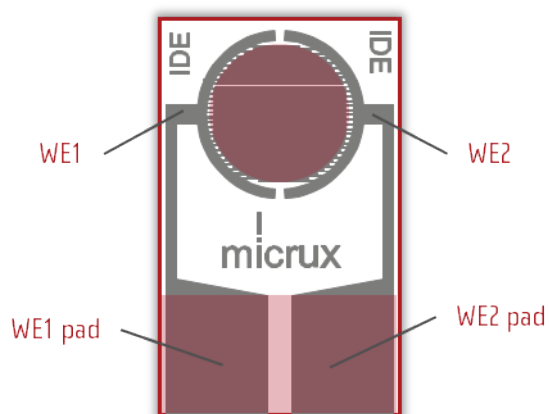
Electrode pre-cleaning by cyclic voltammetry between -1.5V and +1.5 V ($n = 10$, $v = 100 \text{ mV/s}$) – BGE: 0.1 M H_2SO_4 .

1.1.3. Thin-film interdigitated electrodes (IDE)

Thin-film technologies enable the fabrication of microelectrodes (<25 μm) with high resolution and precision. The most basic **interdigitated electrodes (IDE)** consist of **two individually addressable microelectrode array strips with an interdigitated approach**. Non additional reference and auxiliary electrodes are included on the device.

» Electrochemical IDE sensor design

» Electrochemical cell (3.5 mm Ø)



Different interdigitated electrode (IDE) designs are available in platinum or gold.

Reference	Material	$\mu\text{Electrode width}$	$\mu\text{Electrode gap}$	Number of feet	Thickness
» ED-IDE1-Pt	Ti/Pt	10 μm	10 μm	90 pairs	50/150 nm
» ED-IDE2-Pt	Ti/Pt	10 μm	5 μm	120 pairs	50/150 nm
» ED-IDE3-Pt	Ti/Pt	5 μm	5 μm	180 pairs	50/150 nm
» ED-IDE1-Au	Ti/Au	10 μm	10 μm	90 pairs	50/150 nm
» ED-IDE2-Au	Ti/Au	10 μm	5 μm	120 pairs	50/150 nm
» ED-IDE3-Au	Ti/Au	5 μm	5 μm	180 pairs	50/150 nm

These lineal-band electrodes have been specially designed in a circular cell to work with very small sample drops (< 10 μL). The sample drop shape is well-adapted to the electrode cell in order to get the maximum performance and precision.

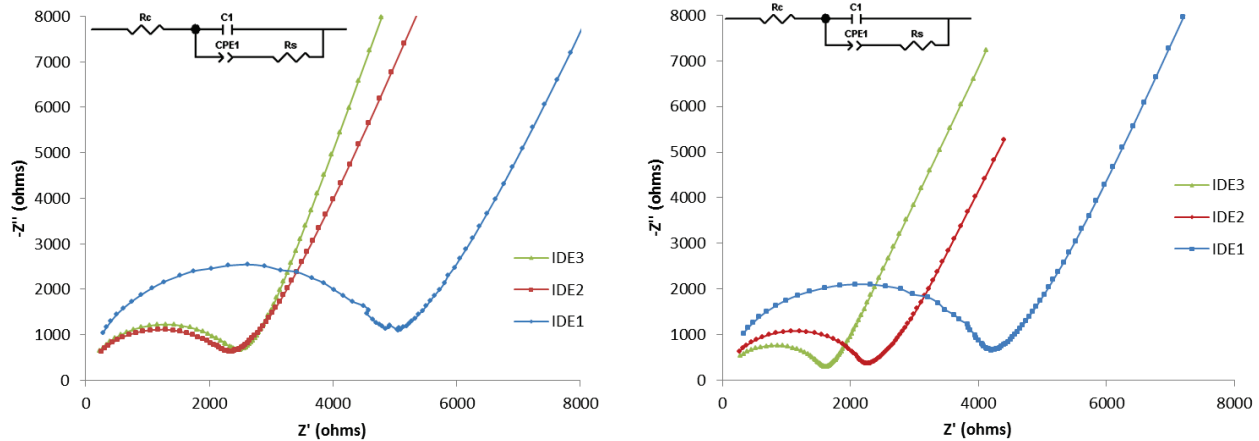
The interdigitated electrodes (IDE) provide a suitable tool especially useful for **impedance**, **capacitance** and **conductivity** measurements as well as **fuel cells**.

Electrochemical Impedance Spectroscopy (EIS) is a powerful, fast and accurate non-destructive method that can be used with the interdigitated electrodes (IDE) in multiple analytical applications.

» Gold thin-film interdigitated electrodes

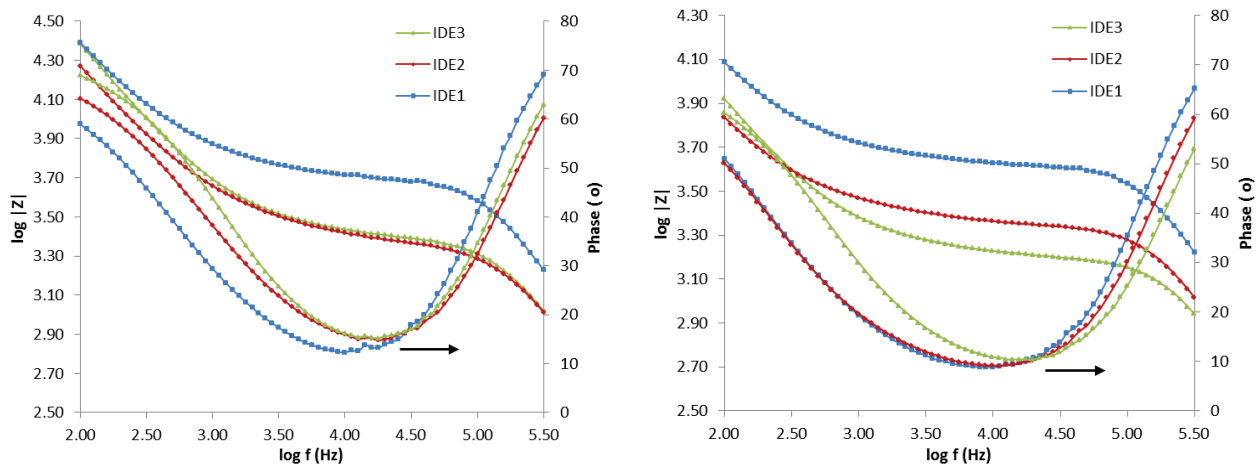
» Platinum thin-film interdigitated electrodes

Nyquist Plots



Nyquist plots using **different** gold and platinum thin-film **interdigitated electrodes** in a low conductivity NaCl solution (6.0 mS/cm). Frequencies range: 500 kHz – 100 Hz, $V_{p-p} = 25$ mV. **Inset:** equivalent electric circuit.

Bode Plots



Bode plots using **different** gold and platinum thin-film **interdigitated electrodes** in a low conductivity NaCl solution (6.0 mS/cm). Frequencies range: 500 kHz – 100 Hz, $V_{p-p} = 25$ mV.

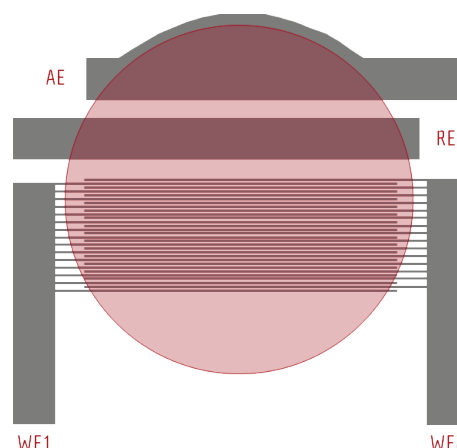
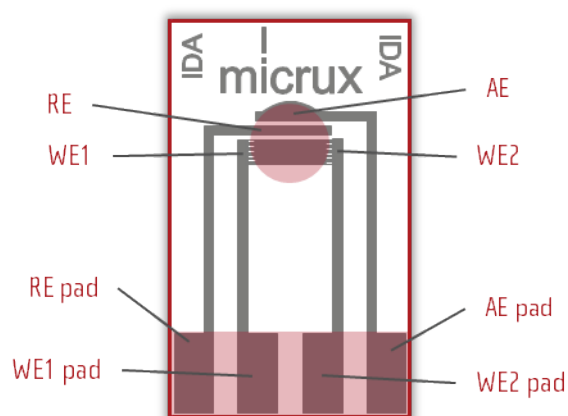
*Impedance spectra data were provided by Nanobiotechnology for Diagnostics (**Nb4D**) Group from Advanced Chemical Research Institute of Catalonia (IQAC-CSIC), Biomedical Research Networking Center in Bioengineering, Biomaterials and Nanomedicine (CIBER-BBN), Barcelona, SPAIN.

1.1.4. Thin-film interdigitated microelectrode array (IDA)

Thin-film technologies enable the integration of the *reference* (RE) and *auxiliary* (AE) electrodes with the interdigitated microelectrodes. **Interdigitated array** (IDA) electrodes take also advantages of the microelectrodes features enhancing the *sensitivity* and *detection limits*. In this case, the working electrode (WE) consists of **two individually addressable arrays** of microelectrodes with an interdigitated approach.

» Electrochemical IDA sensor design

» Electrochemical cell (2 mm Ø)

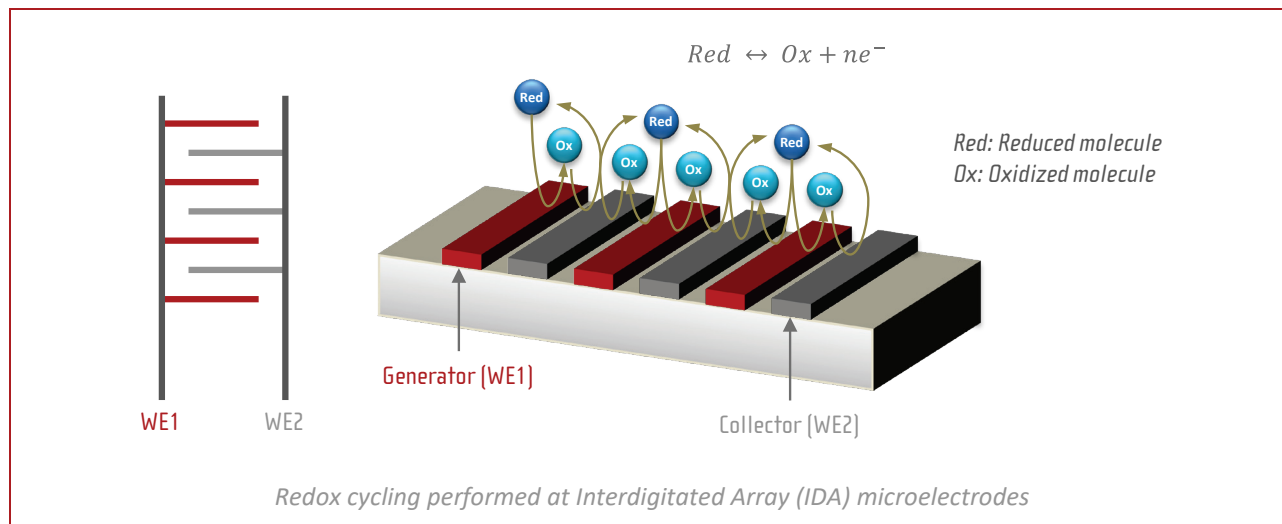


» IDA working electrode

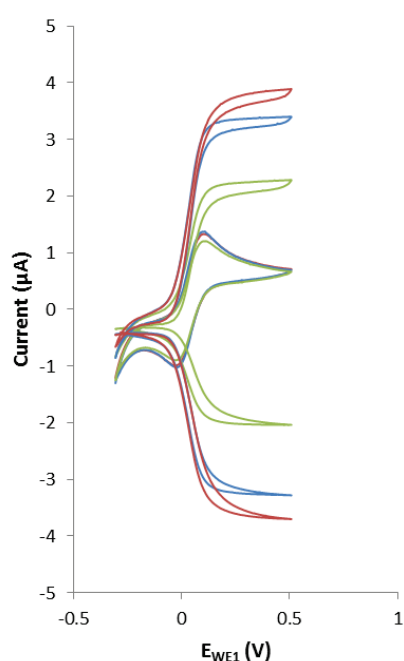
Different IDA microelectrode (WE1/WE2) designs are available in platinum or gold.

Reference	Material	μElectrode width	μElectrode gap	Number of feet	Thickness
» ED-IDA1-Pt	Ti/Pt	10 μm	10 μm	15 pairs	50/150 nm
» ED-IDA5-Pt	Ti/Pt	10 μm	5 μm	20 pairs	50/150 nm
» ED-IDA6-Pt	Ti/Pt	5 μm	5 μm	30 pairs	50/150 nm
» ED-IDA1-Au	Ti/Au	10 μm	10 μm	15 pairs	50/150 nm
» ED-IDA5-Au	Ti/Au	10 μm	5 μm	20 pairs	50/150 nm
» ED-IDA6-Au	Ti/Au	5 μm	5 μm	30 pairs	50/150 nm

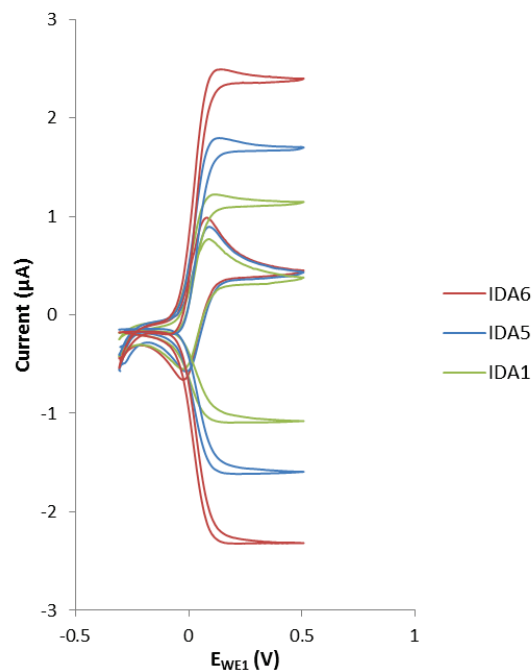
Thin-film IDA electrodes could be used in **single-** (only one WE, *generator*, is connected) or **dual-mode** (both WEs, *generator* and *collector*, are connected). **Dual-mode** enables the **microelectrode behavior**, reaching the **steady-state** in a short time and **enhancing** the analytical signals.



IDA microelectrode designs (*width and gap*) are going to affect the number of *redox cycling* as well as the *collection efficiency*.



Cyclic voltammograms for 1 mM $K_4Fe(CN)_6$ in 0.1 M KCl using **single-** and **dual-mode** at different **Platinum** IDA electrodes



Cyclic voltammograms for 1 mM ferrocene methanol in 0.1 M H_2SO_4 using **single-** and **dual-mode** at different **Gold** IDA electrodes.

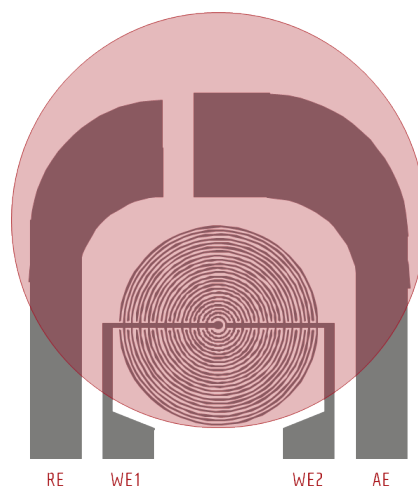
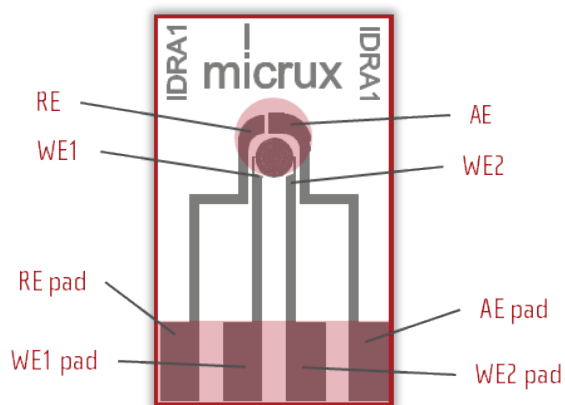
Generator (WE1) potential cycled from -0.3 to 0.5 V at 50 mV/s. **Collector (WE2)** potential held constant at -0.3 V (dual-mode).

1.1.5. Thin-film interdigitated ring array (IDRA)

Thin-film technologies open the gate to develop special microelectrodes designs. **Interdigitated ring array (IDRA)** electrodes bring a radial design specially focused on flow systems. The working electrode consists of **two radial arrays of microelectrodes** with an interdigitated approach.

» Electrochemical IDRA sensor design

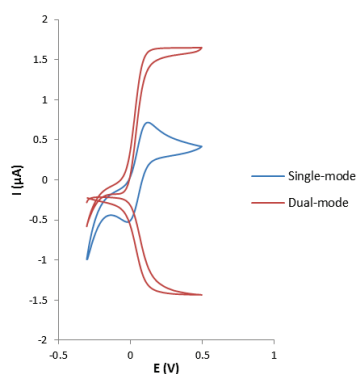
» Electrochemical cell (2 mm Ø)



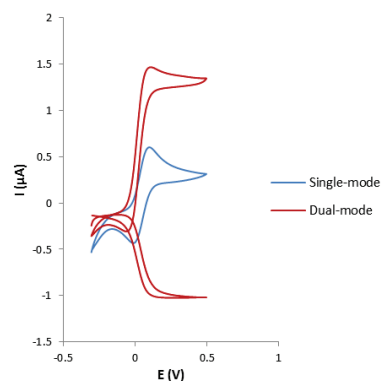
» IDRA working electrode

Reference	Material	μ Electrode width	μ Electrode gap	Number of feet	Thickness
» ED-IDRA1-Pt	Ti/Pt	10 μ m	10 μ m	12 pairs	50/150 nm
» ED-IDRA1-Au	Ti/Au	10 μ m	10 μ m	12 pairs	50/150 nm

Dual-mode enables the **microelectrode behavior**, reaching the **steady-state** in a short time and **enhancing** the analytical signals



Cyclic voltammograms for 1 mM $K_4Fe(CN)_6$ in 0.1 M KCl using **single-** and **dual-mode** at a **Platinum IDRA** electrode.



Cyclic voltammograms for 1 mM ferrocene methylalcohol in 0.1 M H_2SO_4 using **single-** and **dual-mode** at a **Gold IDRA** electrode.

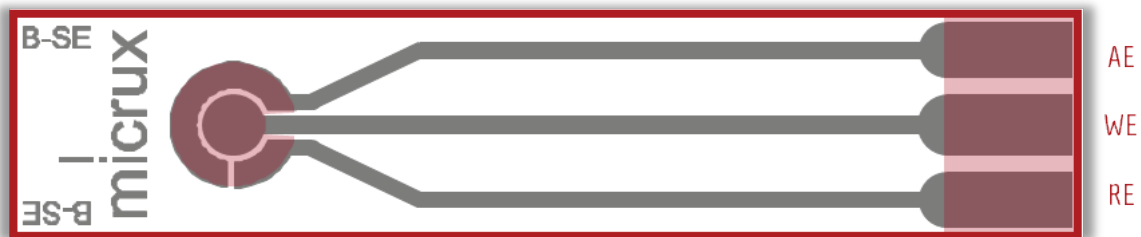
1.1.6. On-demand thin-film electrochemical sensors

MicruX is able to manufacture *off-the-shelf* metal-based thin-film (micro)electrodes as well as other *pre-designed sensors on-demand*. Different *on-demand sensors* are currently available to be manufactured. Metal-based (micro)electrodes are manufactured on a glass substrate with SU-8 resin as insulating layer, delimiting the electrochemical cell.

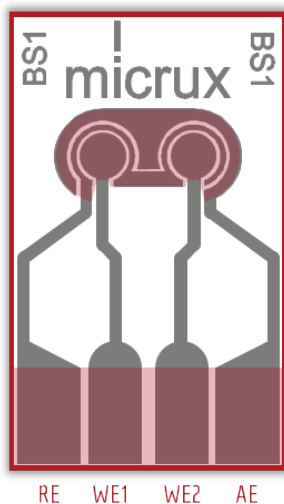
» Basic Single- & Multi-Electrode Systems

Different single- and multi-electrode chips, integrating one or more working electrodes (WE) as well as reference (RE) and auxiliary (AE) electrodes, are easily manufactured by using thin-film technologies. Electrodes are available in gold and platinum.

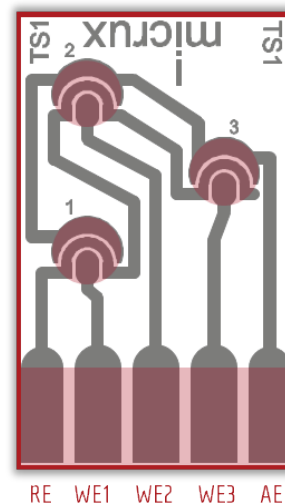
» Single-Sensor



» Dual-Sensor



» Tri-Sensor

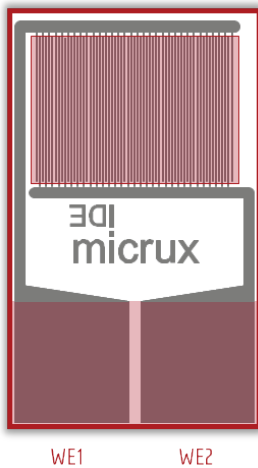


 [more info](#)

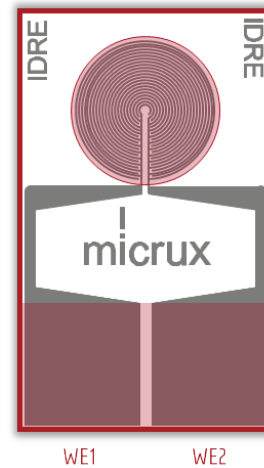
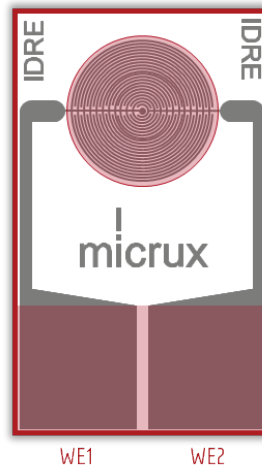
» Basic Interdigitated Lineal & Ring Electrodes

Different lineal (IDE) and ring (IDRE) approaches are available for the basic interdigitated electrodes. Interdigitated electrodes consist of two individually addressable microelectrode array strips.

» IDE sensors



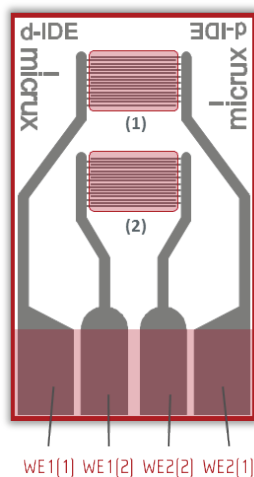
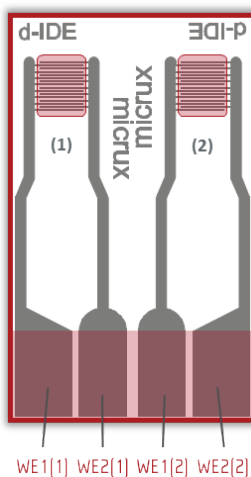
» IDRE sensors



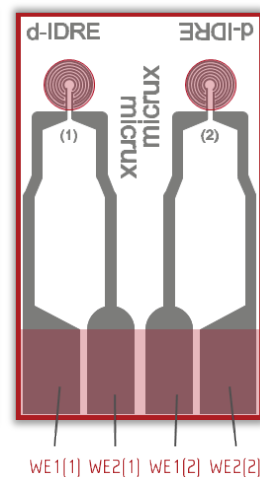
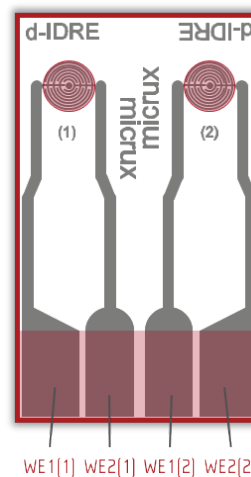
» Dual Interdigitated Lineal & Ring Electrodes

Dual interdigitated electrodes (lineal or ring) can be integrated in a single chip with different configurations.

» Dual-IDE sensors



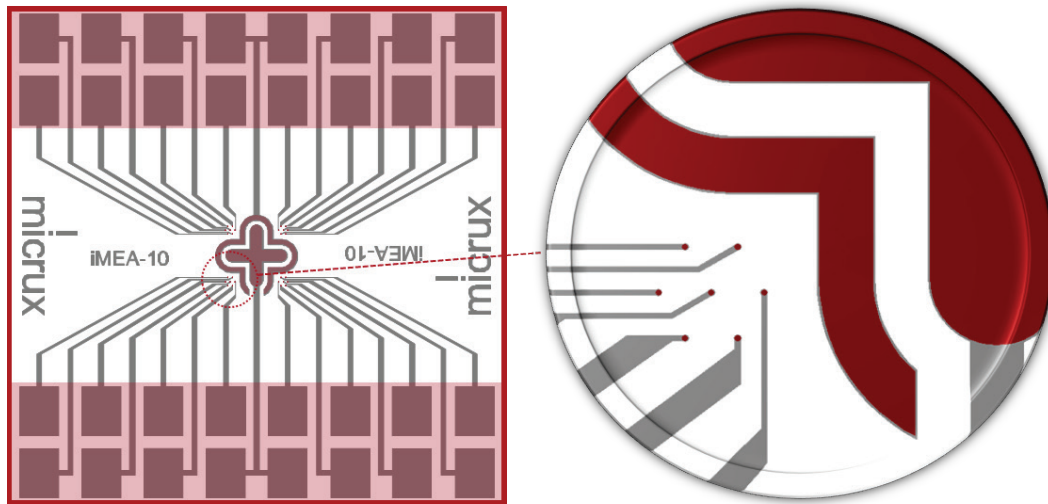
» Dual-IDRE sensors



» Individually Addressable MicroElectrode Arrays

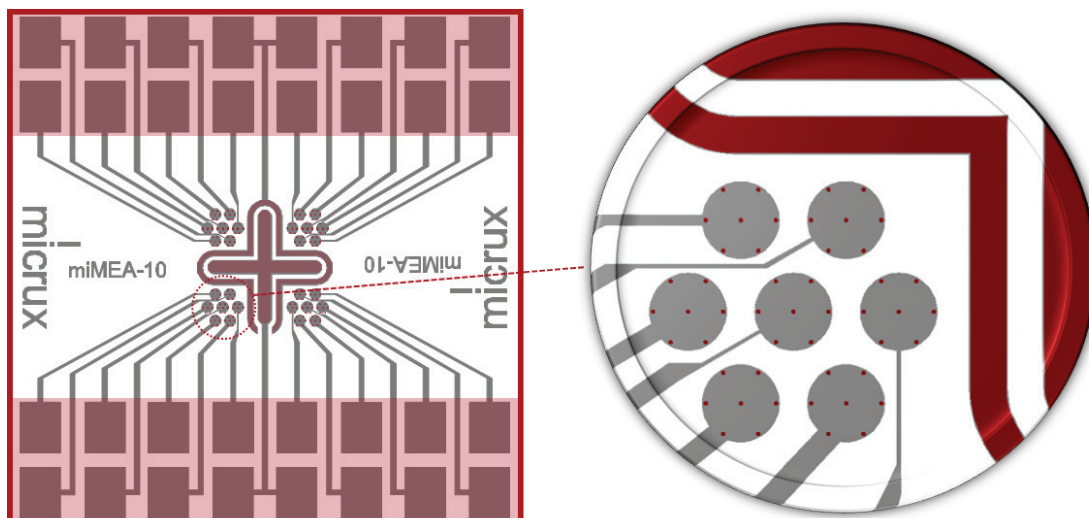
Thin-film technologies enable the manufacture of different individually addressable multi-electrode array (iMEA) systems.

» iMEA chip



iMEA chip consists of four sets of seven 10- μ m microelectrodes (28 individually addressable microelectrodes) with integrated reference and auxiliary electrodes in the center of the chip.

» multi-iMEA chip

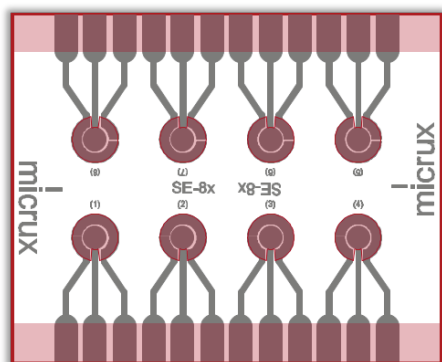


Multi-iMEA chip consists of four areas with seven sets of seven 10- μ m microhole arrays (28 individually addressable microelectrode arrays) with integrated reference and auxiliary electrodes in the center of the chip.

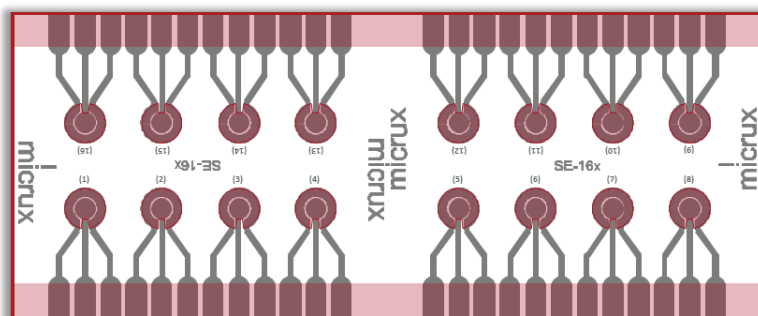
» Multi-Electrodes Chips

Thin-film technologies enable the integration of multiple electrochemical cells in a single chip for multiplexing detection.

» 8x single-electrode chip



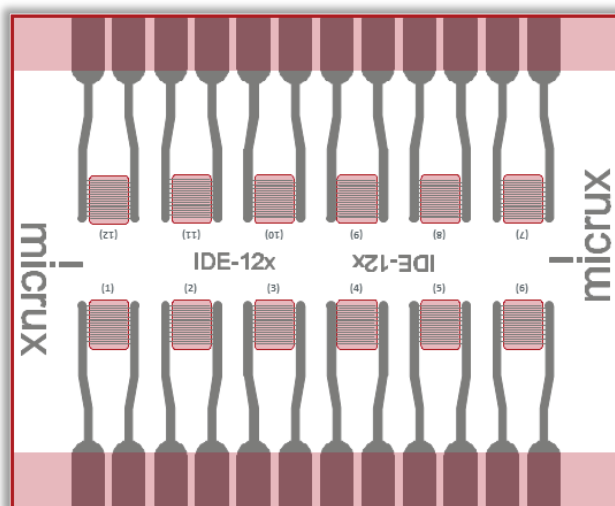
» 16x single-electrode chip



» Multi Interdigitated Electrodes Chips

Thin-film technologies also enable the integration of multiple cells with interdigitated electrodes in a single chip for multiplexing detection.

» Multi-IDE chip



 [more info](#)

1.2. MICROFLUIDIC ELECTROCHEMICAL SENSORS

MicruX develops full-integrated microfluidic electrochemical sensors. **Microfluidics** and **electrochemical sensors** are integrated in a single chip by using **thin-film technologies**. Integrated **thin-layer** hybrid SU-8/Glass chips offer a suitable analytical solution for multiple applications.

» Thin-layer microfluidic sensor features

The basic **microfluidic** structure consists of a **single-channel** manufactured in SU-8 resin on a glass substrate containing the metal-based **(micro)electrodes**.



» External dimensions:	10 x 6 x 0.8 mm
» Substrate:	Glass
» Microfluidic stage:	SU-8 resin
» Channel width:	250 μ m / 1 mm (EC cell)
» Channel height:	40 μ m
» Channel volume:	55 nL
» Inlet / outlet:	0.7 mm \varnothing
» Electrode material:	Platinum or Gold

Integrating **microfluidics** with **electrochemical sensors** allow to improve the **control of fluids** on the electrode surface. Microfluidic electrochemical sensors are used as **thin-layer based flow-cell** in flow injection analysis (**FIA**) systems. Microfluidics enable the accurate control of low sample/ reagents volume (55 nL internal channel volume) through the electrodes. It offers several advantages for the modification of the electrode surface and the development of **chemical sensors** and **biosensors**.

» Thin-layer accessories

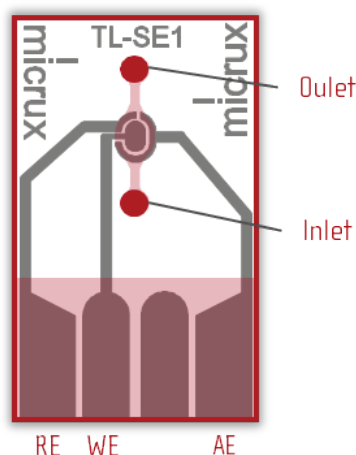


Microfluidic sensors are compatible with the innovative **All-in-One (AIO) platform** (see *electrochemical platforms*). A special **add-on** has been developed for using the microfluidic electrochemical sensors in a **flow system** with a **thin-layer** approach. The **thin-layer based flow-cell** improves the control of fluids getting **better precision** with **lower dead volume** and **low sample** requirements.

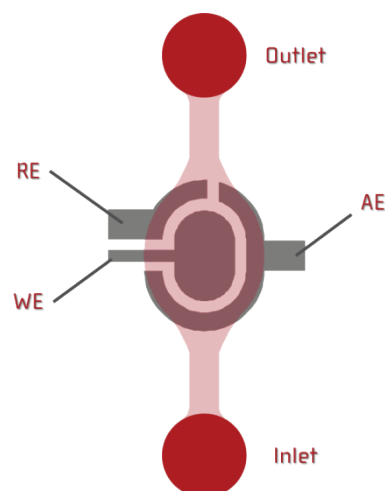
1.2.1. Thin-layer microfluidic single sensor

A basic **three-electrode system** is integrated easily in the **microfluidic chips** by thin-film technologies. The working electrode is placed in the center of the single-microchannel to get the highest performance.

» Microfluidic single sensor design

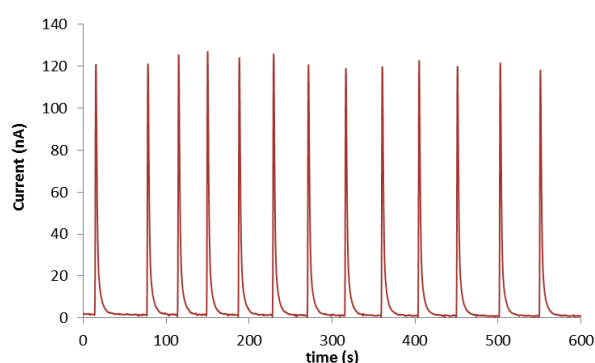


» Microfluidic Electrochemical cell



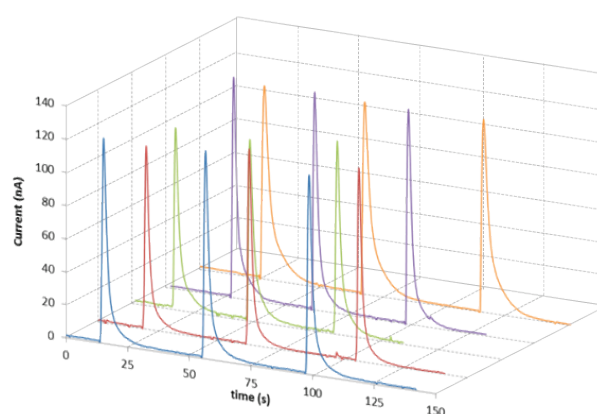
Reference	Electrodes Material	WE area	Electrodes thickness
» TL-SE1-Pt	Ti / Pt	0.3 mm ²	50/150 nm
» TL-SE1-Au	Ti / Au	0.3 mm ²	50/150 nm

Microfluidic single sensors can be used in a flow injection analysis (FIA) system with a thin-layer approach. Thin-layer based flow cells can improve the reproducibility and sensitivity in multiple analytical applications.



Successive injections of $1 \cdot 10^{-5}$ M pAP in a FIA system using a **thin-layer microfluidic single platinum electrode** (TL-SE1-Pt). RSD = 2%, $n = 13$.

Carrier: 0.1 M PBS, pH = 7.4, flow rate = 1.0 mL/min, $E_d = +0.4$ V.

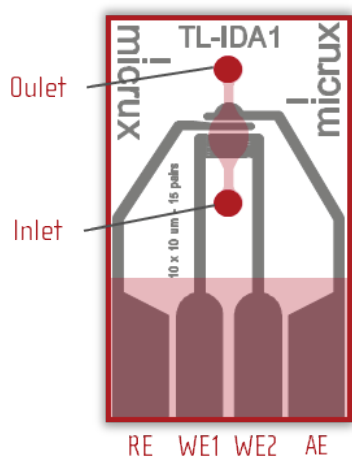


Amperometric response for $1 \cdot 10^{-5}$ M pAP in a FIA system using different **thin-layer microfluidic chips** (TL-SE1-Pt).

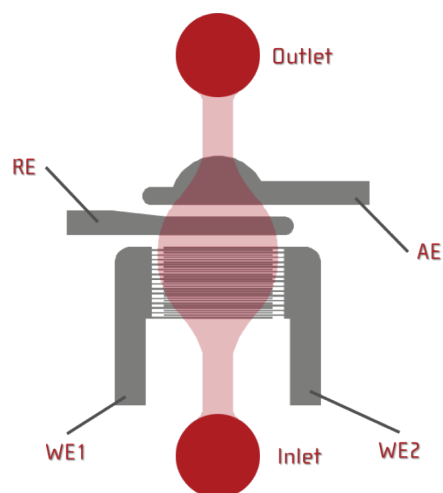
1.2.2. Thin-layer microfluidic interdigitated array sensor

Interdigitated array electrodes are integrated in the microfluidic chips by thin-film technologies. The working electrode (WE) consists of two individually addressable arrays of microelectrodes with an interdigitated approach.

» Microfluidic interdigitated sensor design



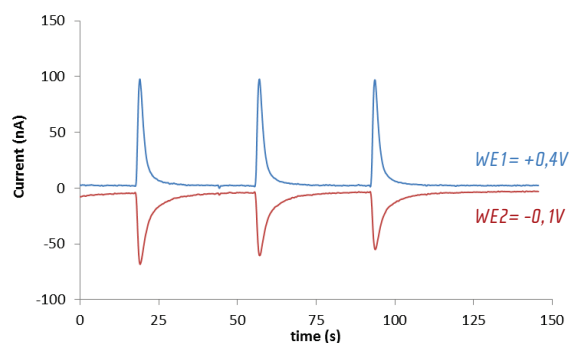
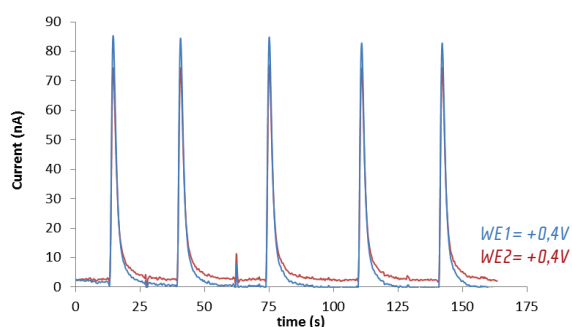
» Microfluidic Electrochemical cell



» IDA working electrode

Reference	Material	μElectrode width	μElectrode gap	Number of feet	Thickness
» TL-IDA1-Pt	Ti/Pt	10 μm	10 μm	15 pairs	50/150 nm
» TL-IDA1-Au	Ti/Au	10 μm	10 μm	15 pairs	50/150 nm
» TL-IDA5-Pt	Ti/Pt	5 μm	5 μm	30 pairs	50/150 nm
» TL-IDA5-Au	Ti/Au	5 μm	5 μm	30 pairs	50/150 nm

Microfluidic interdigitated sensors enable the use of the same or different detection potential simultaneously in a thin-layer based flow analysis system. Interdigitated sensors can enhance the sensitivity and selectivity of the analytical systems.



Amperometric response for $1 \cdot 10^{-5}$ M pAP in a FIA system using a thin-layer microfluidic interdigitated array platinum electrode (TL-IDA1-Pt) applying same and different detection potentials.

Carrier: 0.1 M PBS, pH = 7.4, flow rate = 1.0 mL/min.

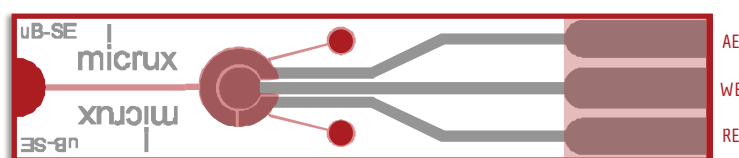
1.2.3. On-demand microfluidic electrochemical sensors

MicruX is able to manufacture *off-the-shelf* microfluidic devices with integrated metal-based thin-film (micro)electrodes as well as other *pre-designed* microfluidic sensors *on-demand*. Different *on-demand microfluidic sensors* are currently available to be manufactured. Metal-based (micro)electrodes are manufactured on a glass substrate integrating a microfluidic stage on SU-8 resin.

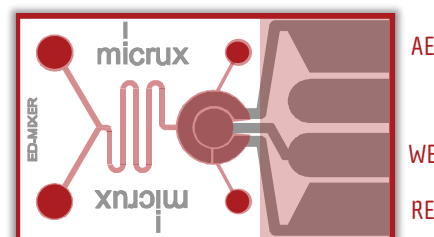
» Basic Microfluidic Single Sensors & Mixer Chips

A basic microfluidic stage can be integrated with a three electrode system (working – WE, reference – RE, and auxiliary – AE electrode) in order to manage the sample load in the electrochemical cell. In the same way, a microfluidic mixing stage can be also integrated on-chip previously to the sensing area.

» Microfluidic Single-Sensor



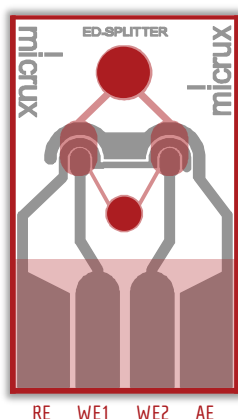
» Microfluidic Mixer Chip



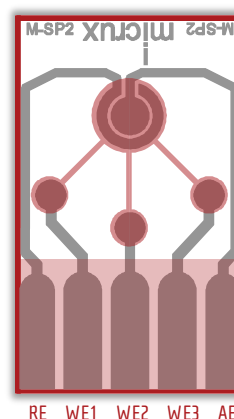
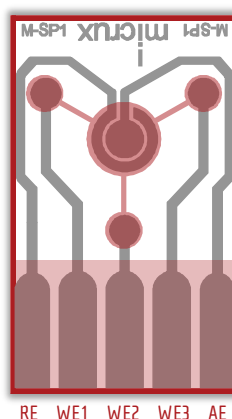
» Microfluidic Splitter Chips

A multiplexed detection can be accomplished on chip by integrating a microfluidic stage to split up the sample in several individual sensing points.

» Microfluidic Splitter Chip



» Microfluidic Multi-Splitter Chips



1.3. ELECTROCHEMICAL PLATFORMS

1.3.1. Drop-cell interface

The drop-cell connector (**Ref. ED-DROP-CELL**) provides a true user-friendly interface with the potentiostat, enabling the use of microvolume (1 – 10 μ L sample drops) with all standard (10 x 6 mm) thin-film (micro)electrodes.



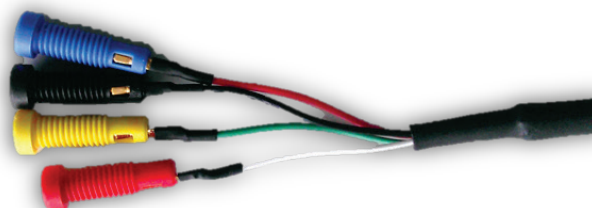
- » **Dimensions:** 40 x 30 x 25 mm (WxDxH)
- » **Material:** aluminium base + methacrylate cover
- » **User friendly** (tool free assembly).
- » **Easy and fast replacement** of the electrodes.
- » **High quality** robust connector.
- » **Reusable** – long-life.

The drop-cell connector, flow-cell (**ref. ED-FLOW-CELL**) and AIO-cell (**ref. ED-AIO-CELL**) are supplied with a universal cable compatible with any commercial potentiostat.



miniUSB to EC Drop/Flow/AIO-cell

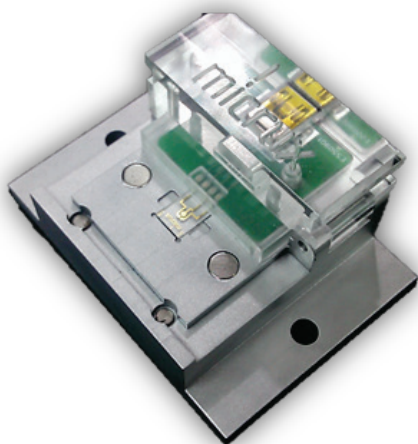
Female/male banana plug to potentiostat



Plug to potentiostat may be available in another format under previous request.

1.3.2. All-in-One Platform

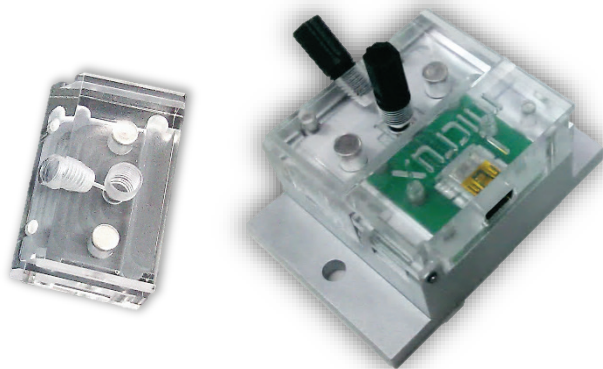
The innovative All-in-One cell (*ref. ED-AIO-CELL*) provides an unique multipurpose interface with movable add-ons that can be easily interchanged for using the standard (10 x 6 mm) thin-film (micro)electrodes.



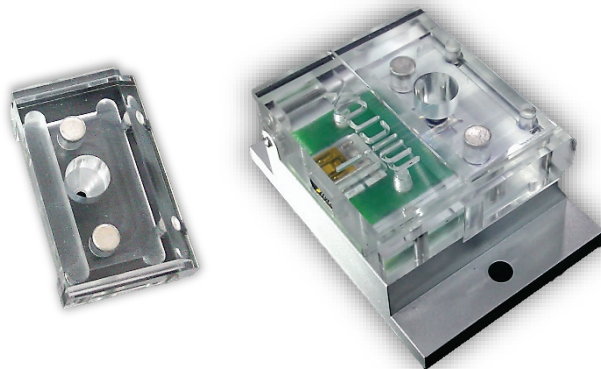
- » **Dimensions:** 60 x 40 x 30 mm (WxDxH)
- » **Material:** aluminium base + methacrylate cover/add-ons
- » **Easy and fast** electrode **replacement**.
- » Different **movable** Add-Ons.
- » **Easy** Add-Ons **assembly** (tool free).
- » **Reusable** – long life.

The AIO-cell enables the use of the thin-film (micro)electrodes in **static** (*Drop / Batch-cell*) or **dynamic** (*Flow-cell*) conditions, fulfilling the requirements of **multiple** analytical **applications**.

Movable Add-Ons



Flow-cell Add-ons



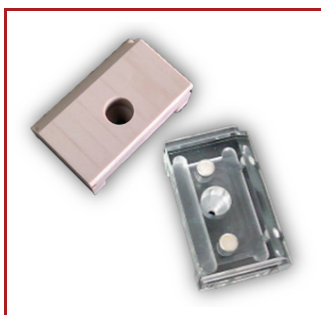
Batch-cell Add-ons

The AIO-cell is currently provided in two versions, the base cell + one add-on (*ref. ED-AIO-CELL-1x*) or the base cell + two add-ons (*ref. ED-AIO-CELL-2x*). Additional **add-ons** in **PMMA** (standard) or **PEEK** (on demand) can be provided with the base cell. The add-ons can be also supplied by separated and they can be customized (*materials / designs*) taking into account the specific requirements of the customers.



Different **Flow-cell** and **Batch-cell** add-ons in **PMMA** (standard) and **PEEK** (on demand) are currently available for using in combination with the AIO platform and all standard (10 x 6 mm) thin-film (micro)electrodes.

» AIO add-ons



» Batch-cell Add-ons

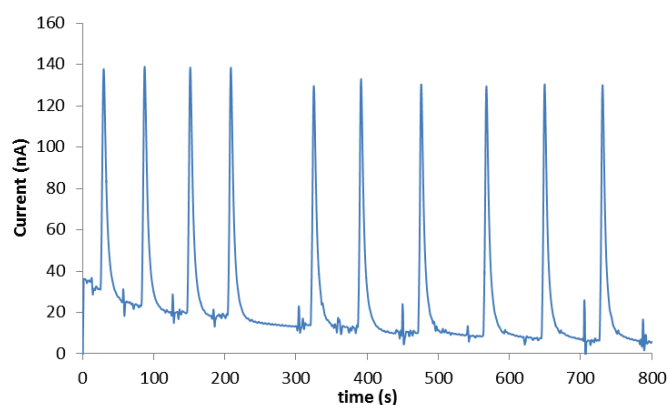
- ❖ **BC-PMMA-2,0 / BC-PEEK-2,0.** Compatible with thin-film (micro)electrodes with 2 mm diameter electrochemical cell. The cell is sealed with a 3 mm I.D. O-ring.
- ❖ **BC-PMMA-3,5 / BC-PEEK-3,5.** Compatible with thin-film ID μ Electrodes with 3,5 mm diameter electrochemical cell. The cell is sealed with a 3,5 mm I.D. O-ring



» Flow-cell Add-ons

- ❖ **FC-PMMA-2,0 / FC-PEEK-2,0.** Compatible with thin-film (micro)electrodes with 2 mm diameter electrochemical cell. The cell is sealed with a 2 mm I.D. O-ring.
- ❖ **FC-PMMA-3,5 / FC-PEEK-3,5.** Compatible with thin-film ID μ Electrodes with 3,5 mm diameter electrochemical cell. The cell is sealed with a 3,5 mm I.D. O-ring
- ❖ **TL-PMMA-1,0 / TL-PEEK-1,0.** Compatible with microfluidic electrochemical sensors. The inlet/outlet of the microfluidic channel is sealed with two 1,15 mm I.D. O-rings.

Amperometric measurements in a **Flow Injection Analysis** (FIA) system using the **AIO cell** with add-on **FC-PMMA-2,0** and MicruX **HVStat** instrument (ref. *HVSTAT2010*).



Successive injections of $1 \cdot 10^{-5}$ M pAP in the FIA system using a **thin-film Pt single-electrode** (ED-SE1-Pt). Carrier: 0.1 M PBS, pH = 7.4, flow rate = 1 mL/min, $E_d = +0.4$ V. **RSD = 4%**, $n = 10$.

1.3.3. Multi8x All-in-One Platform

The Multi8x All-in-One cell (*ref. ED-MULTI8x-AIO-CELL*) provides a **multiplexing** interface with movable add-ons that can be easily interchanged for using up to **eight** thin-film (micro)electrodes.



- » **Dimensions:** 120 x 40 x 30 mm (WxDxH)
- » **Material:** aluminium base + methacrylate cover/add-ons
- » **Easy and fast electrode replacement.**
- » Different **movable** Add-Ons.
- » Add-Ons **assembly** by screws.
- » **Reusable** – long shelf-life.

The multi8x AIO-cell enables the use of up to **eight** thin-film (micro)electrodes in **static** (*Drop / Batch-cell*) or **dynamic** (*Flow-cell*) conditions, providing a **multiplexed detection** system in several applications.

Movable Add-Ons



Multi-Flow-cell Add-ons



Multi- Batch-cell Add-ons

The Multi8x AIO-cell is currently provided in two versions, the base cell + one add-on (*ref. ED-MULTI8x-AIO-CELL-1x*) or the base cell + two add-ons (*ref. ED-MULTI8x-AIO-CELL-2x*). Additional **add-ons** in **PMMA** (*standard*) or **PEEK** (*on demand*) can be provided with the base cell. The add-ons can be also supplied by separated and they can be customized (*materials / designs*) taking into account the specific requirements of the customers.

Different **Multi-flow-cell** and **Multi-batch-cell** add-ons in **PMMA** (standard) and **PEEK** (on demand) are currently available for using in combination with the multi8x AIO platform and all standard (10 x 6 mm) thin-film (micro)electrodes.

» Multi8x AIO add-ons



» Multi-batch-cell Add-ons

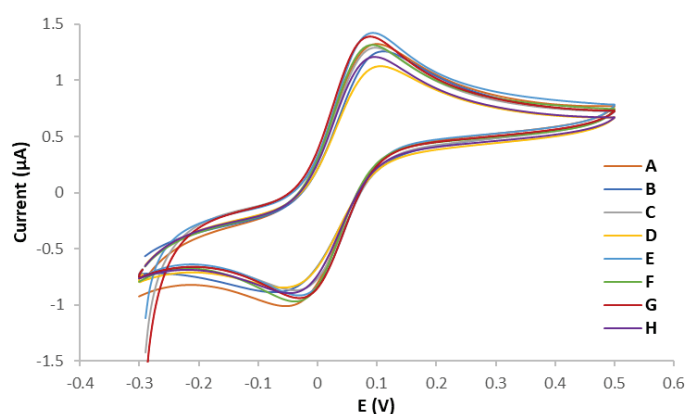
- ❖ **Multi8x-BC-PMMA-5,0 / Multi8x-BC-PEEK-5,0.** Compatible with thin-film (micro)electrodes with 2 mm or 3,5 mm diameter electrochemical cell. The cell is sealed with a 5 mm I.D. O-ring.
The batch cell add-on features correspond to a column (A → H) of a 96-well microplate with up to 400 µL per well.



» Multi-flow-cell Add-ons

- ❖ **Multi8x-FC-PMMA-2,0 / Multi8x-FC-PEEK-2,0.** Compatible with thin-film (micro)electrodes with 2 mm diameter electrochemical cell. The cell is sealed with a 2 mm I.D. O-ring.
- ❖ **Multi8x-FC-PMMA-3,5 / Multi8x-FC-PEEK-3,5.** Compatible with thin-film IDµElectrodes with 3,5 mm diameter electrochemical cell. The cell is sealed with a 3,5 mm I.D. O-ring
- ❖ **Multi8x-TL-PMMA-1,0 / Multi8x-TL-PEEK-1,0.** Compatible with microfluidic electrochemical sensors. The inlet/outlet of the microfluidic channel is sealed with two 1,15 mm I.D. O-rings.

Multi8x AIO platform enable the simultaneous or sequential employment of up to **eight electrode chips** in static (see Figure) or dynamic (flow-system) conditions by using a multi-potentiostatic station.

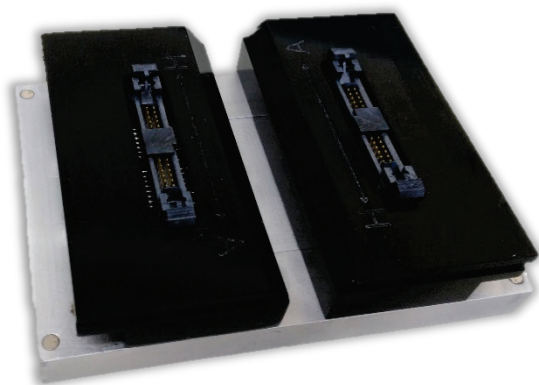


Simultaneous cyclic voltammograms for 1 mM $K_4Fe(CN)_6$ in 0.1 M KCl using **eight (from A to H)** different **thin-film Pt electrodes** (ED-SE1-Pt) with the **Multi8x AIO-cell**. $v = 50$ mV/s, $RSD < 5\%$.

1.3.4. Multi-electrode Chip Platform

The multi-electrode chip platform (**Ref. ED-ME-CELL**) provides a simple and robust interface with a multi-potentiostat for using the thin-film multi-electrode chips developed by MicruX.

- **Multi-electrode platform (main unit)**



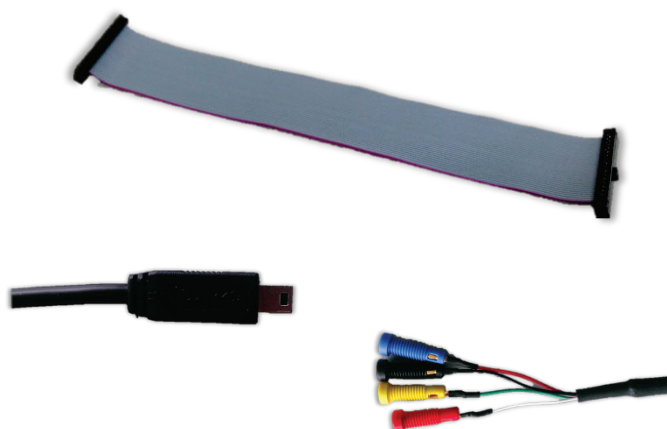
- » **Dimensions:** 70 x 95 x 25 mm (WxDxH)
- » **Material:** aluminium base + methacrylate covers
- » **User friendly** (tool free assembly).
- » **Easy and fast replacement** of the electrodes.
- » **Reusable** – long -life.
- » **Compatible** with up to 37x15 mm chips.

The multi-electrode platform consists of a main unit with chip accommodation and electronics, two interconnection boxes and universal cables for interfacing with any commercial multi-potentiostat. The platform enables up to *48 individual connections*. This cable interfacing is also provided with Multi8x AIO platform (**ref. ED-MULTI8x-AIO-CELL**).

- **Interconnection box**



- **Cables**



The platform enables the use of **on-demand sensors**, up to two **18.5x15 mm chips** or one **37x15 mm chip**. **Tailored multi-electrode chips** adapted to this platform can be manufactured with the specific requirements of the customers. The **interface** (connector box, cables...) for a specific **multi-potentiostat** can be also **customized**.

1.3.5. External Electrodes Platform

The EEP Platform (*ref. EEP-AIO-CELL*) enables the use of external electrodes in the AIO-cell in static conditions with the batch-cell add-ons. The EEP Platform simplify the placement of the external electrodes in the AIO-cell to be used with the MicruX' thin-film electrodes.

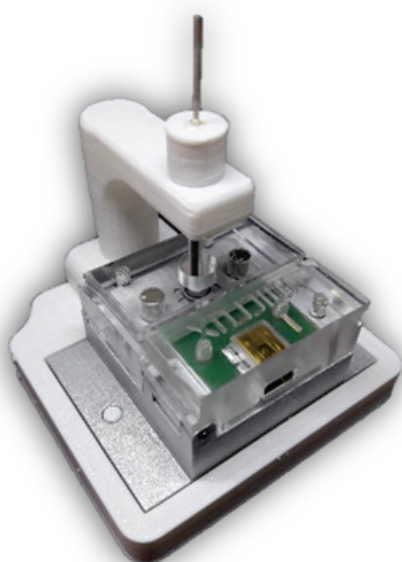


- » **Dimensions:** 75 x 65 x 35 mm (WxDxH)
- » **Material:** PLA
- » **Easy** AIO-cell fitting.
- » Different **Arms** for the placement of external electrodes.
- » **Easy** and **Fast** arm positioning.
- » **External electrodes** are always placed in the same position

The **EEP Platform** can be used to place just the *external reference electrode* or the *reference and auxiliary electrodes* together.

Platform with external reference electrode

Platform with external reference & auxiliary electrodes

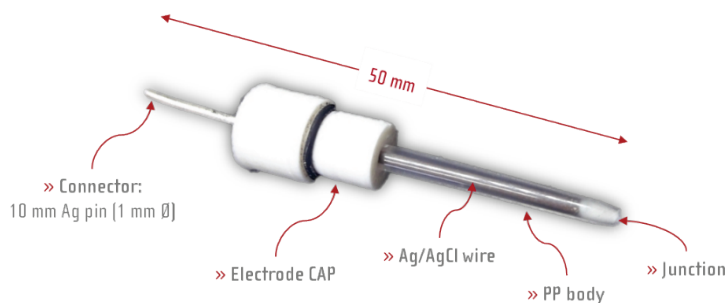


The platform is compatible with the **external miniaturized electrodes** (*reference & auxiliary electrodes*) provided by MicruX.

MicruX provides **miniaturized reference** (Ag/AgCl) and **auxiliary/counter** (Pt or SS) electrodes for using with MicruX' thin-film (micro)electrodes and EEP-AIO platform. **External electrodes** (reference and auxiliary/counter electrodes) can be a useful solution in several electroanalytical applications.

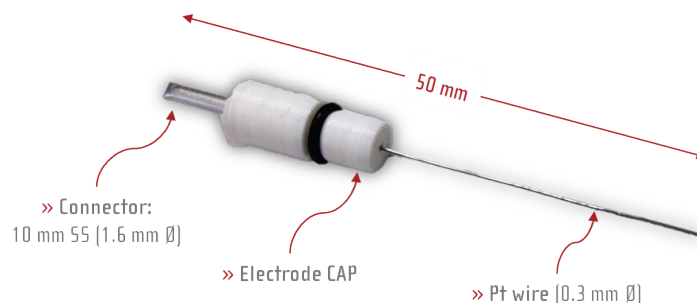
» Reference Electrode – Ag/AgCl

Miniaturized reference electrode consists of a **silver/silver chloride** (Ag/AgCl) wire inserted in a **polypropylene** (PP) body with 3M KCl as supporting electrolyte (**Ref. RE-Ag/AgCl**).



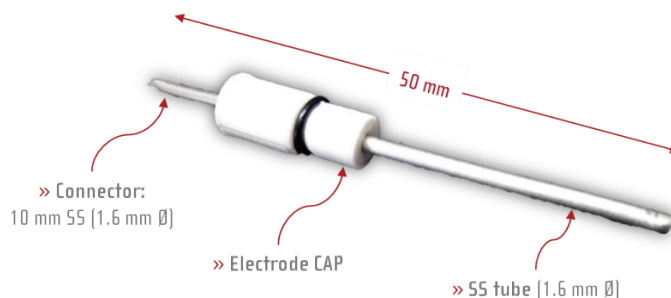
» Auxiliary/Counter Electrode – Pt

Auxiliary/counter electrodes are made of a highly inert material. Thus, MicruX provides **Platinum** Auxiliary/Counter electrodes (**Ref. CE-Pt**).

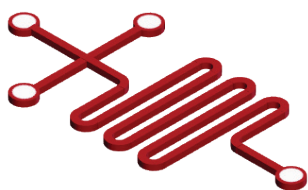


» Auxiliary/Counter Electrode – SS

Auxiliary/counter electrodes can be made of other inexpensive materials. Thus, MicruX also provides **Stainless Steel (SS)** Auxiliary/Counter electrodes (**Ref. CE-SS**).



2. MICROFLUIDIC SOLUTIONS



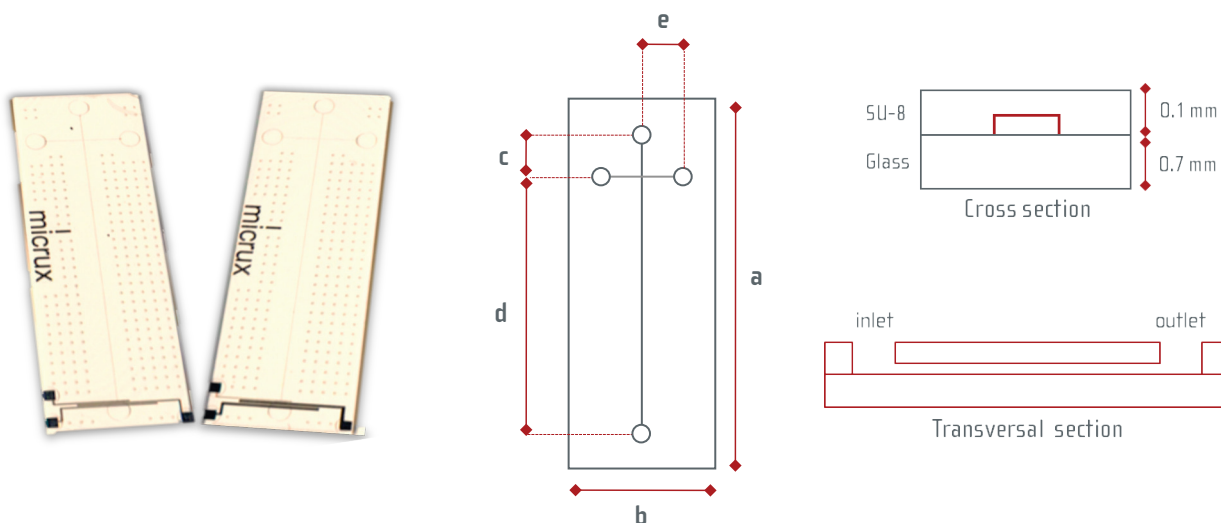
*MicruX develops standard and customized **microfluidic chips** with integrated **(micro)electrodes** for electrochemical measurements. MicruX also develops easy-handle **microfluidic platforms** as well as portable and automated analytical **instruments**. MicruX brings the perfect microfluidic solutions for multiple applications in research field.*

2.1. MICROFLUIDIC CHIPS

MicruX develops reusable *microfluidic electrophoresis chips* manufactured on highly resistant hybrid SU-8/Glass material. Microfluidic chips are fabricated with integrated electrodes or microelectrodes on the Glass cover plate.

» SU-8/Glass single-channel microfluidic electrophoresis chips

Standard **microfluidic electrophoresis chips** consist of two crossed microchannels fabricated on *EPON SU-8 resin* with integrated *thin-film electrodes* on glass cover plate.



Highly resistant hybrid **SU-8/Glass** material for **reusable** microfluidic chips.

Long life (over 1000 runs/injections) with a low-cost, high efficiency and precision.

» Microfluidic chips features

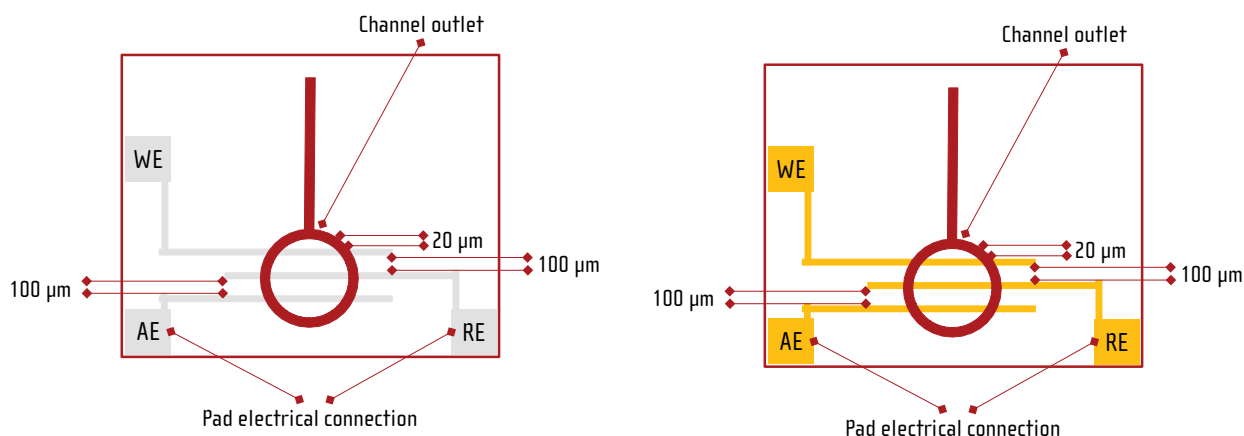
Channel Geometry (μm)		Access holes (mm)	Microchip dimensions (mm)				
width	depth		a	b	c	d	e
50	20	2	38	13	5	30	5

Different designs and materials for integrated thin-film electrodes, including microelectrode and interdigitated arrays, are available.

2.1.1. SU-8/Glass microfluidic chips with integrated electrodes

Microfluidic electrophoresis chips are supplied with a basic **three-electrode system** integrated on the glass cover plate. Thin-film electrodes are placed at the outlet of the separation channel with an **end-channel approach**.

» Integrated thin-film electrodes

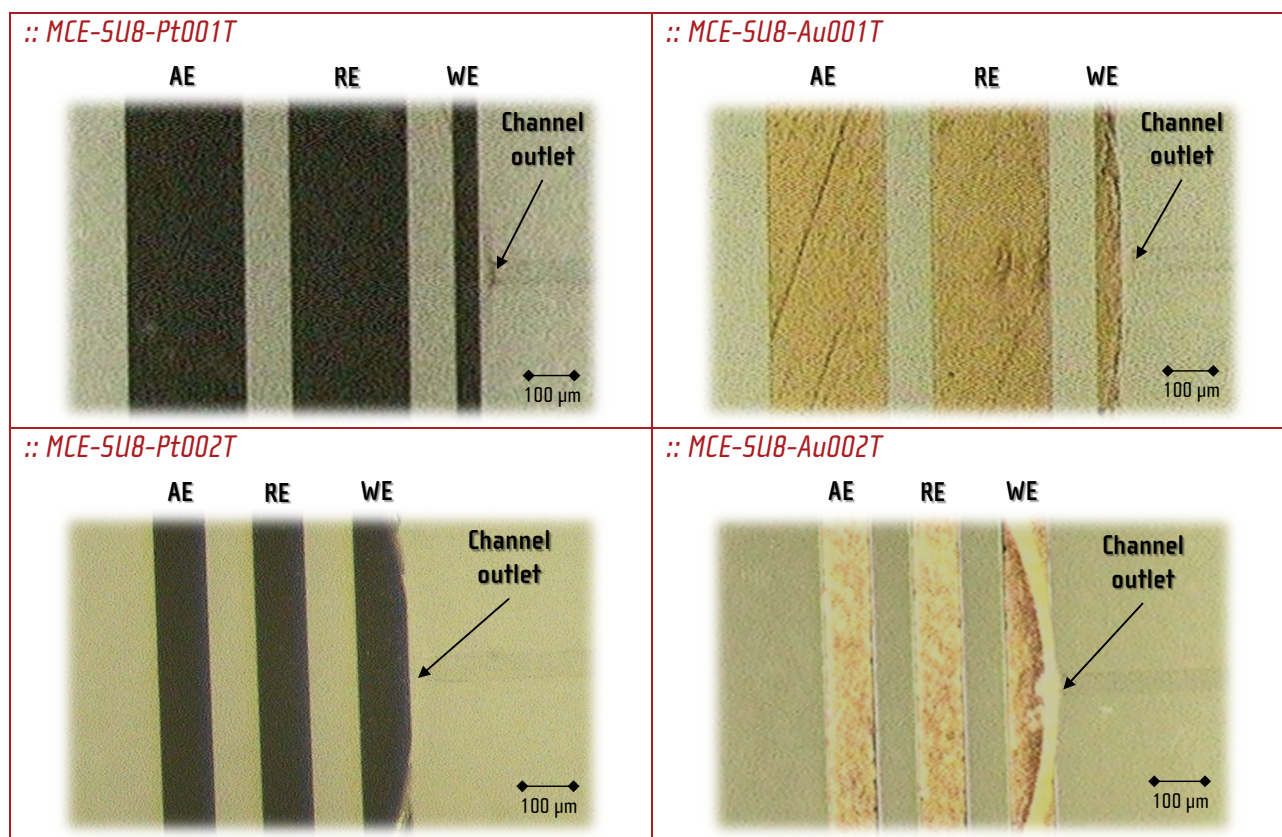


- » **WE**: working electrode.
- » **RE**: reference electrode.
- » **AE**: auxiliary electrode.

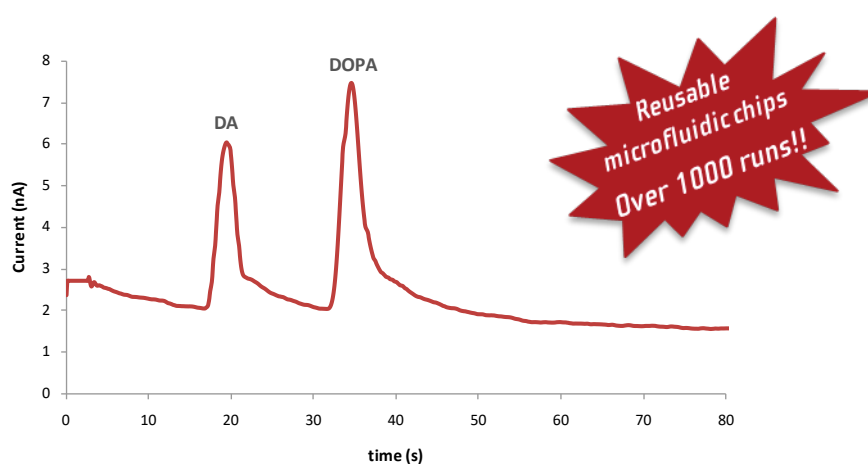
Thin-film electrodes integrated on-chip are available in different designs and materials:

Reference	Electrode features				
	Material	WE width	RE width	AE width	Thickness
» <i>MCE-SU8-Pt001T</i>	Ti/Pt	50 μm	250 μm	250 μm	50/150 nm
» <i>MCE-SU8-Au001T</i>	Ti/Au	50 μm	250 μm	250 μm	50/150 nm
» <i>MCE-SU8-Pt002T</i>	Ti/Pt	100 μm	100 μm	100 μm	50/150 nm
» <i>MCE-SU8-Au002T</i>	Ti/Au	100 μm	100 μm	100 μm	50/150 nm

**Customized designs of microfluidic chips and electrodes are available on demand.*



Separation of neurotransmitters dopamine (DA) and DOPA performed using a **SU-8/glass microchip** (ref. MCE-SU8-Pt001T) in combination with the microfluidic platform (ref. MCE-HOLDER-SC01) and MicruX® HVStat instrument (ref. HVSTAT2010).



Electropherogram for the separation of 100μM DA and 500μM DOPA using a SU-8/glass single-channel microchip.
Conditions: Running buffer: 25mM MES-His pH = 6.0; $V_{inj} = +750V$ for 5s, $V_{sep} = +1000V$, $E_d = +0.75V$ (vs. Pt)

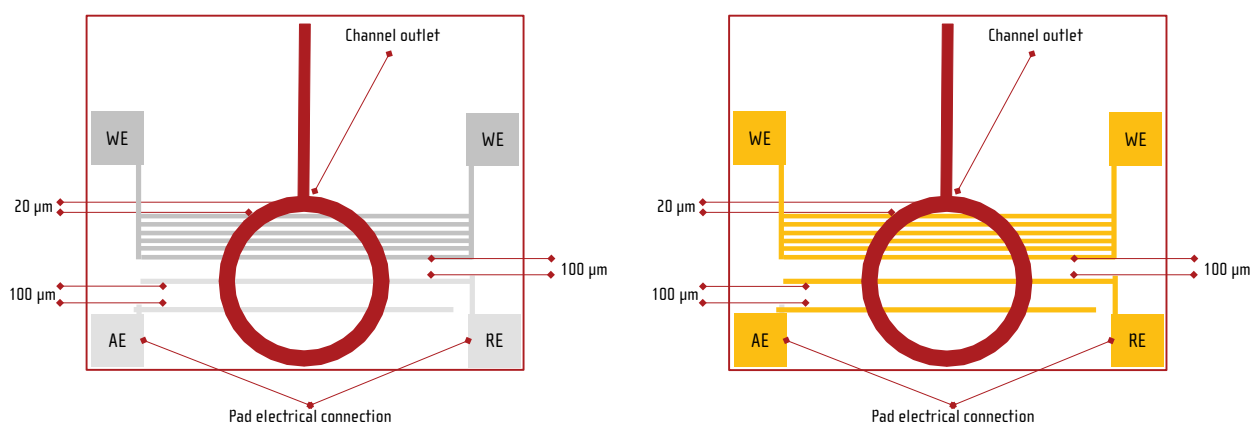
2.1.2. SU-8/Glass microfluidic chips with integrated microelectrodes

SU-8/Glass microfluidic chips are also provided with integrated **microelectrodes** on the glass cover plate. The working electrode is available in two different configurations: *microelectrode array (MEA)* and *interdigitated array (IDA)*.

» SU-8/Glass single-channel microchips with microelectrode array (MEA)

The working electrode consists of six 10- μ m microelectrodes with 10- μ m gap. Thin-film microelectrodes are integrated at the outlet of the separation channel with an end-channel approach.

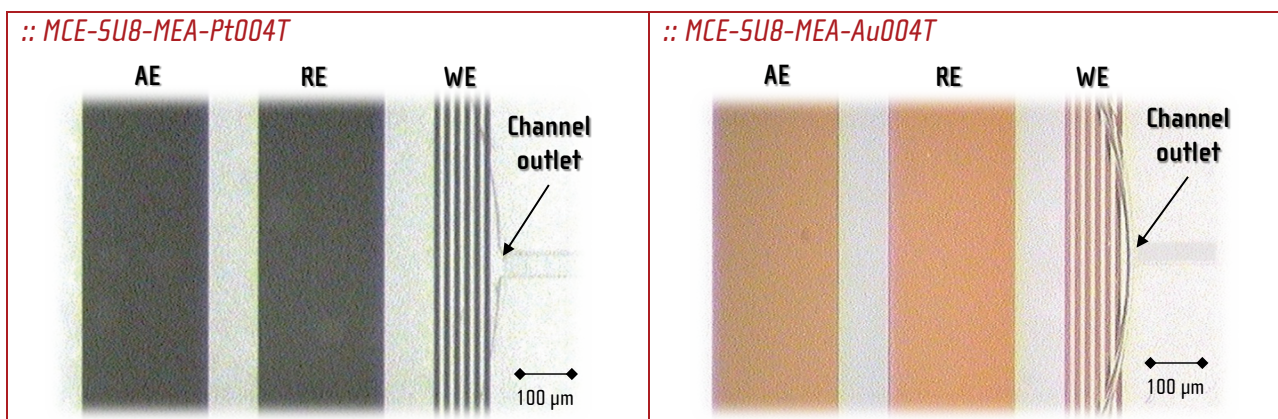
» Integrated microelectrode array



- » **WE**: working electrode.
- » **RE**: reference electrode.
- » **AE**: auxiliary electrode.

Thin-film microelectrodes integrated on-chip are available in different materials:

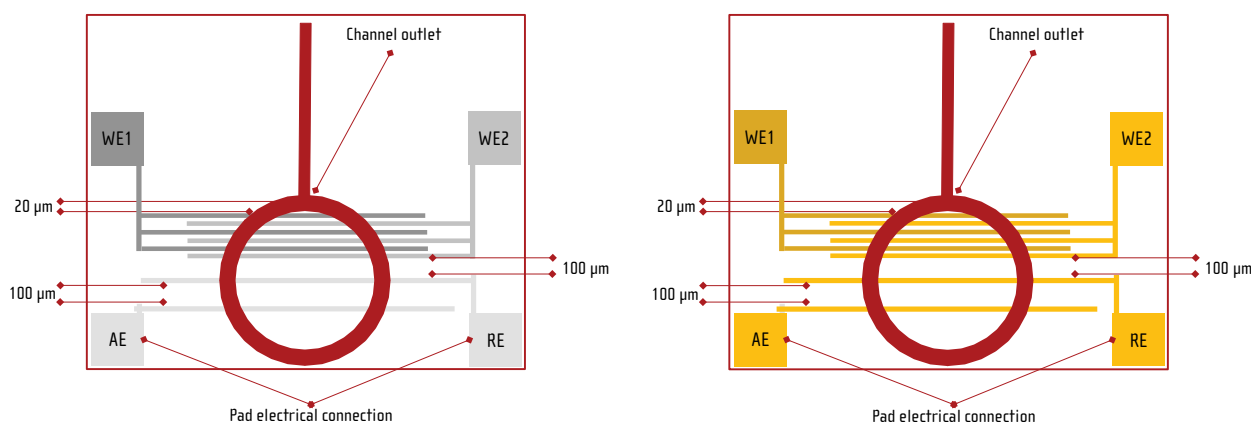
Reference	Material	Working Electrode (WE)			RE width	AE width	Thickness
		μ Electrode width	μ Electrode gap	μ Electrodes number			
» <i>MCE-SU8-MEA-Pt004T</i>	Ti/Pt	10 μ m	10 μ m	6	250 μ m	250 μ m	50/150 nm
» <i>MCE-SU8-MEA-Au004T</i>	Ti/Au	10 μ m	10 μ m	6	250 μ m	250 μ m	50/150 nm



» SU-8/Glass single-channel microchips with interdigitated array (IDA)

The working electrode (WE) consists of two individually addressable arrays of three 10-µm microelectrodes with an interdigitated approach. A 10-µm gap is shown between microelectrodes of interdigitated array (WE1/WE2). The electrodes are integrated at the outlet of the separation channel with an end-channel approach.

» Integrated microelectrode array



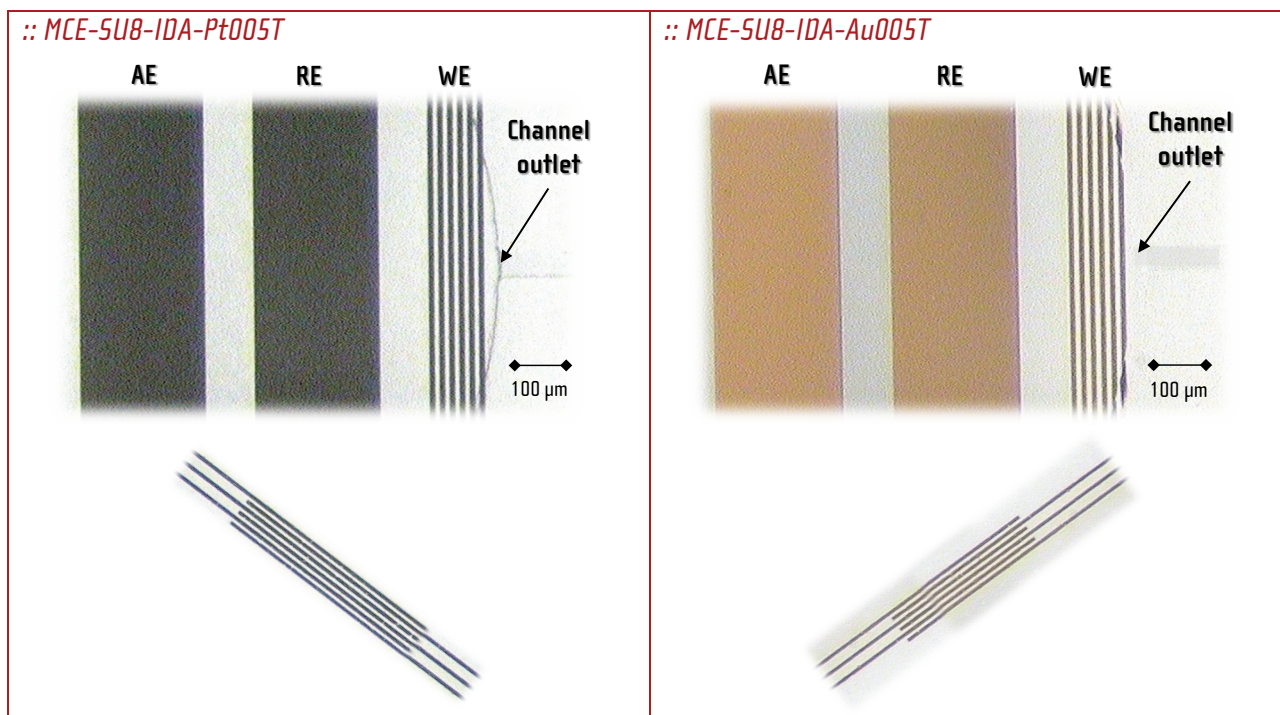
» WE1/WE2: working electrodes.

» RE: reference electrode.

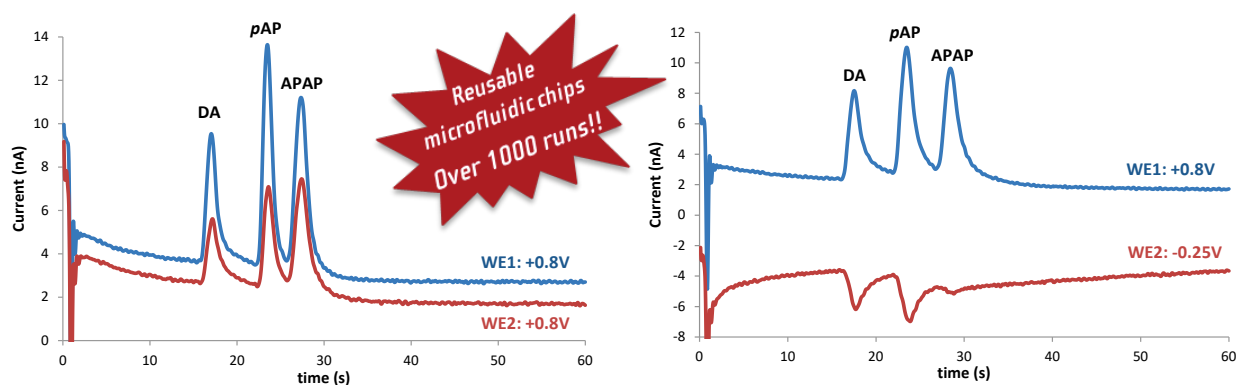
» AE: auxiliary electrode.

Thin-film microelectrodes integrated on-chip are available in different materials:

Reference	Material	Working Electrode (WE)			RE width	AE width	Thickness
		µElectrode width	µElectrode gap	Number of feet			
» MCE-SU8-IDA-Pt005T	Ti/Pt	10 µm	10 µm	3 pairs	250 µm	250 µm	50/150 nm
» MCE-SU8-IDA-Au005T	Ti/Au	10 µm	10 µm	3 pairs	250 µm	250 µm	50/150 nm



Separation of phenolic compounds performed using a **SU-8/Glass microchip with integrated IDA microelectrode** (ref. MCE-SU8-IDA-Pt005T) in combination with the microfluidic platform (ref. MCE-HOLDER-DC02) and Micrux® HVStat instrument (ref. HVSTAT2010).



Electrophorograms for the separation of 100 μM DA, 100 μM pAP and 250 μM APAP using a SU-8/glass single-channel microchip with an IDA microelectrode applying same and different detection potentials. Conditions: Running buffer: 20mM MES pH = 6.0; $V_{inj} = +750V$ for 3s, $V_{sep} = +1000V$.

2.1.3. Microfluidic manufacturing services

MicruX is able to manufacture a wide variety of **customized microfluidic devices** and other **basic tools** for the development of your own microfluidic parts. The microfluidic devices and tools are adapted to fulfill the requirements of customers.

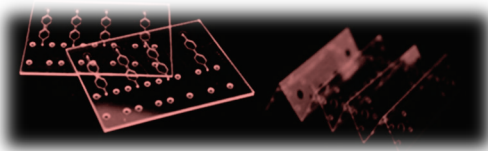
» Microfluidics chips with integrated electrodes

MicruX enables the design and **integration of (micro)electrodes** in **SU-8/Glass** based **microfluidic devices** in order to perform electrochemical measurements. The design and prototyping of the SU-8/Glass chips as well as electrodes are adapted to the specific requirements of customers.

» Polymer microfluidics chips

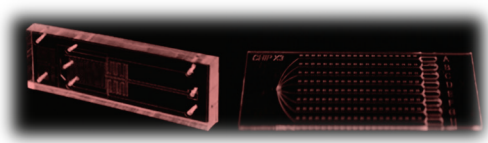
MicruX' expertise supports the development of customer's microfluidic devices from **idea** or concept, going through **prototyping**, to **high-mass** production of the final product. Different **manufacturing technologies** are available for the development of polymer microfluidic structures:

» Thin Films Cutting & Lamination



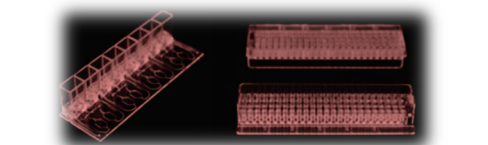
Thin & flexible foils cutting & lamination is an excellent technology for rapid prototyping of microfluidic components in a very cost-effective way.

» Hot Embossing



Hot embossing is a suitable technology for prototyping and small / medium-scale production of microfluidic components with high resolution and precision.

» Injection Molding



Injection molding is the most appropriate technology for large-scale production of microfluidic components with low-cost *per* each single injected part.

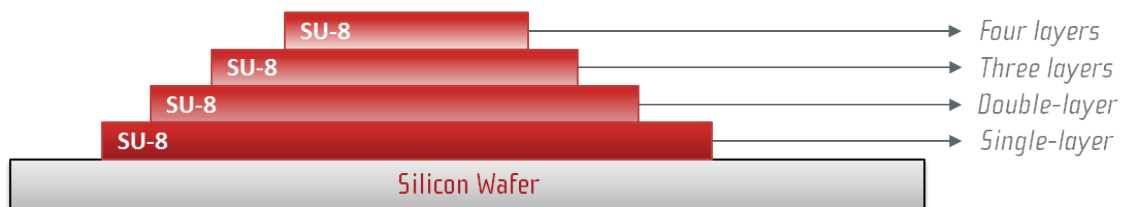
Different polymer materials, **thermoplastics** such as *COC/COP, PMMA, PC, PS, PET...*, are available for the fabrication of the microfluidic structures.



» Multilayer (3D) SU-8 mould on silicon wafers

Multilayer (3D) SU-8 microstructures can be manufactured on a Silicon wafer (4 inch) in order to get master moulds with high precision and resolution.

Up to four SU-8 layers (*3D microfluidics*) can be patterned with high aspect ratio on silicon substrates:

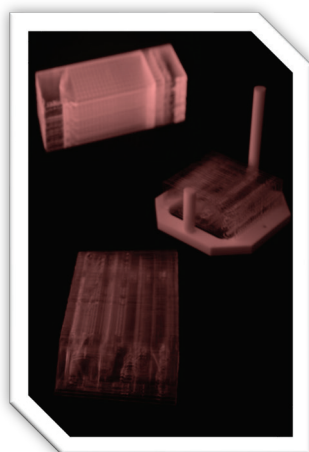


Silicon wafer could be cut on smaller rectangular pieces in order to get individual masters. Other technical features can be fulfilled under request.

SU-8 master moulds provide a cost-effective and useful tool for soft casting polymers (like PDMS) as well as hot-embossing processes.

» Other Services

Other additional services can be provided together with the manufacturing processes or by separated, depending on the requirements of customers.



» Bonding services

Different bonding technologies are available for closing the microfluidic structures.

» Surface functionalization & reagent lyophilization

The surface of polymer microstructures can be functionalized with different reagents before the bonding process.

» Packaging

Vacuum packaging and autoclaved are also available for the microfluidic devices.



 [more info](#)

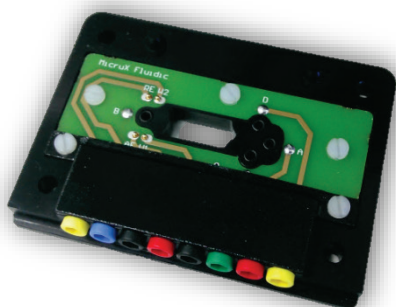
2.2. MICROFLUIDIC PLATFORMS

2.2.1. Microfluidic Platform DC series

The platform DC (*ref. MCE-HOLDER-DC02*) is a perfect complement for using in combination with *MicruX® HVStat & iHVStat*. The microfluidic platform is the newest friendly interface for easy use of microfluidic electrophoresis chips with integrated electrochemical detection (including MEAs and IDAs).



» Technical characteristics



- » **Dimensions:** 100 x 65 x 15 mm (L x W x H).
- » **Material:** black-methacrylate.
- » **Integrated wells** (buffer solution, sample, waste and detection reservoir).
- » **High voltage electrodes:** Platinum (300 µm Ø) integrated on the cover.
- » **Electrical contacts** for detection and voltage electrodes on integrated PCB.
- » **Integrated 2-mm female bananas** for instruments connection.
- » **Reusable.**
- » It can be used with **standard microfluidic electrophoresis chips** (38 x 13 mm) with integrated electrodes for single- & dual-mode amperometric detection.

2.3. INSTRUMENTATION

An additional instrumentation such as high-voltage power supplies and potentiostat is required to use the microfluidic chips and electrochemical sensors.

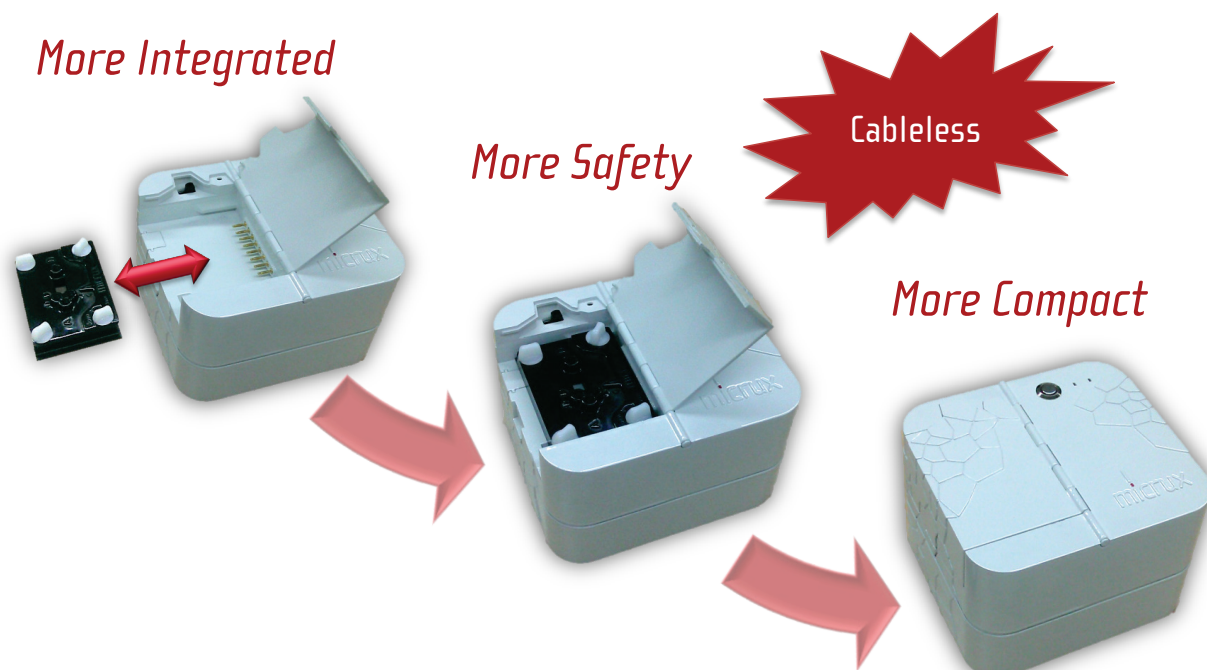
MicruX manufactures a new generation of instruments for using microfluidic electrophoresis chips with integrated electrochemical detection as well as other microfluidic devices.

2.3.1. Automated microfluidic electrophoresis systems

» MicruX® iHVStat

iHVStat (*ref. iHVSTAT2012*) brings the new evolution of electrophoresis systems based on *microfluidic chips* with *amperometric detection*.

- » **Dimensions:** 165 x 150 x 95 mm (L x W x H).
- » **Battery-powered** (LiPo – 3300 mAh).
- » **Control PC software.**
- » **Interfacing:** Serial RS232/ USB Adapter/ wireless (Bluetooth®).
- » **LED indicators:** power, Bluetooth®, cable.



» MicruX® HVStat

HVStat (*ref. HVSTAT2010*) was the first microfluidic electrophoresis system that combined in a portable equipment a *high voltage power supply* and a *bipotentiostat* for dual amperometric detection. In this model, external cables are used for connecting the microfluidic platform with microchips electrophoresis.

- » **Dimensions:** 165 x 150 x 85 mm (L x W x H).
- » **Battery-powered** (LiPo – 3300 mAh).
- » **Control PC software.**
- » **Interfacing:** Serial RS232/ USB Adapter/ Bluetooth®.
- » **LED indicators:** power, Bluetooth®, cable.



TECHNICAL FEATURES: High Voltage Power Supply

» Power:	1W
» Channels/ outputs:	1/ 4
» Outputs polarity:	Positive/negative
» Output voltage:	$\pm 3000V$
» Max. output current:	0,34mA
» Ripple:	< 1%
» Operating temperature:	-20°C to +70°C
» Storage temperature:	-20°C to +105°C
» Humidity:	20% to 85% RH

TECHNICAL FEATURES: Bipotentiostat

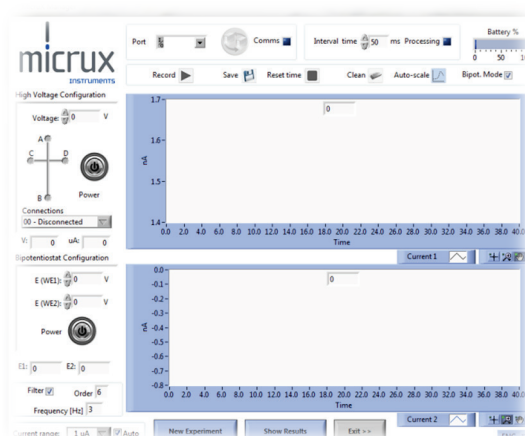
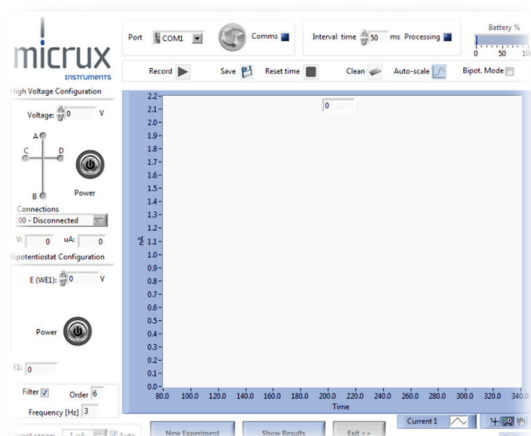
» DC-potential range:	$\pm 2,00V$
» DC-potential resolution:	1mV
» DC-offset error:	$\pm 1mV$
» Accuracy:	$\leq 0,1\%$
» Current ranges:	1nA to 1 μA (4 ranges)
» Maximum current:	$\pm 2\mu A$
» Current resolution:	0,1% of current range / 1pA on lowest current range
» Electrochemical techniques:	DC amperometric detection (AD) Pulsed amperometric detection (PAD)
» Run time:	1s - ∞ (Experiments 1s – 1000h)
» Interval time:	10ms - 1000s (RS232/ USB)
» Pulse time:	5ms - 1000s (RS232/ USB)
» Maximum number of points:	No limited (depending of computer memory)

MicruX® *HVStat* & *iHVStat* instruments are provided in a suitcase with all the necessary accessories for connecting it to a PC and using the microfluidic devices.

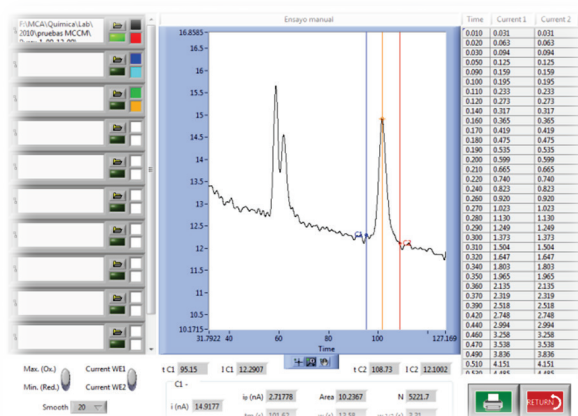
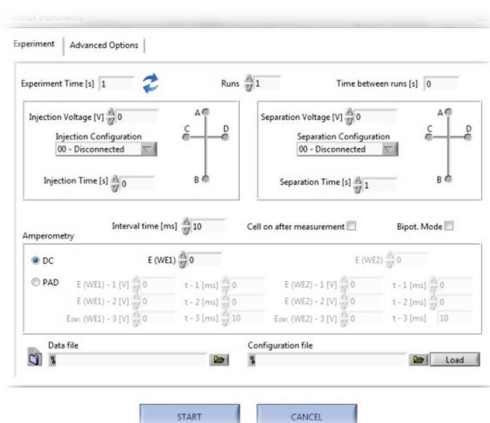


» MicruX® Manager software

MicruX Manager is a graphical user interface (GUI) to control the high voltage power supply and bipotentiostat of *HVStat* & *iHVStat*.



MicruX Manager main interface for single- and dual-mode detection



MicruX Manager experiment & results windows

2.4. MICROFLUIDIC TEACHING PACKS

MicruX develops laboratory practice protocols for using the miniaturized instrumentation as teaching tool. These practices are focused on **Analytical Chemistry Practical Courses** (clinical, pharmaceutical, environmental, food and beverage analysis) for undergraduate & postgraduate students.

The aim of these practices is to increase the knowledge of students about principles and applications of **capillary electrophoresis technique** as well as **electrochemistry**.

Different packs are available for each practice, from a *full-* to a *basic-pack*, in order to fulfill the particular necessities of all educational centers.

2.4.1. Full Pack (MXF-PLAB-FP) & iPack (MXF-iPLAB-FP)

The most complete pack includes all the tools necessities for introducing the students in the use of miniaturized instrumentation and microfluidic devices.

» Pack content



» MicruX® **HVStat** (or **iHVStat** for iPack) Instrument + Accessories (Ref. *HVSTAT2010* or *iHVSTAT2012*).

» Microchip **Holder** DC series (Ref. *MCE-HOLDER-DC02*).

» **Microchips** electrophoresis with integrated electrodes (Ref. *MCE-SU8-Pt001T*).

» **Teacher's guide:** includes detailed description of the experiments with the most relevant theoretical and practical aspects.

» **Student's guide:** includes a brief description about the main outlines of the experiments to be performed.

» **Excel Template:** for collecting the experimental data and studying the results.

» **Reagents:** specific chemicals for preparing the standard and buffer solutions.

» **Other material** (syringes, filters, sample containers...) necessary for carrying out the experiments.

2.4.2. Standard Pack (MXF-PLAB-5P)

» Pack content



- » Microchips electrophoresis (Ref. MCE-SU8-Pt001T).
- » Teacher & Student's guide.
- » Excel Template.
- » Reagents.
- » Other material (syringes, filters, sample containers...).

2.4.3. Basic Pack (MXF-PLAB-BP)

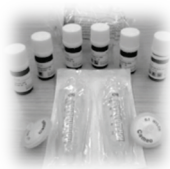
» Pack content



- » Teacher & Student's guide.
- » Excel Template.
- » Reagents.
- » Other material (syringes, filters, sample containers...).

2.4.4. Spare Kit (MXF-PLAB-5K)

» Pack content



- » Reagents.
- » Other material (syringes, filters, sample containers...).

» Teaching Packs

Several practical protocols are being developed in order to involve different relevant fields such as health, environment, food and beverage.

Lab Practice Protocol I

- » Analysis of uric acid and related compounds in urine sample using ME-ED

Lab Practice Protocol II

- » Analysis of paracetamol and vitamin C in pharmaceuticals using ME-ED

3. ACCESSORIES FOR MICROFLUIDICS & ELECTROCHEMISTRY




*MicruX provides any additional **accessories** necessities to suitable work with **microfluidic devices**, **electrochemical sensors** and portable analytical **instrumentation**.*

3.1. PUMPING SYSTEMS

Different **pumping systems** are available for the use of **microfluidic** and **electrochemical** solutions provided by MicruX or any other supplier.

3.1.1. Multi-channel Peristaltic Tube Pump

Peristaltic pumps offer a *low-cost* solution with an *excellent performance* for most **lab applications** with flow systems.

TECHNICAL FEATURES	
 <p>CE For lab applications</p>	» Speed: 0.1 to 100 rpm, reversible
	» Speed precision: 0.1 rpm
	» Control mode: Membrane keypad (start/stop, direction and speed).
	» Display: 3-digit LED display for current speed. 3 LED indicators for operating state
	» Power-off memory: Return to previous state when power on
	» Prime key: Fast filling and emptying at full speed
	» Power supply: AC 90V-260V / 30W
	» Operating temperature: 0 to 40 °C
	» Relative humidity: < 80%
	» Dimensions (D X W X H): 232 x 142 x 149 mm
	» Weight (without head): 2.3 Kg


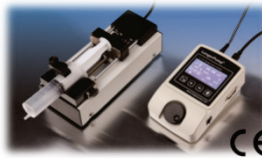

Pump heads are designed for micro-flow rates and multi-channel fluids transfer. Easy to change and fix the tubing. Occlusion can be adjusted slightly. The rollers adopt high quality materials. The pump head consists of base, rotor assembly and easily dismounted cartridge.

Reference	# Rollers (material)	# Channels	Tubing	Max. pressure	Flow rate
» LP-BT100-2J / DG-2(10)	10	2	ID < 3.17 mm	15 psi	0.002 –
» LP-BT100-2J / DG-4(10)	(stainless steel)	4	Wall thickness 0.8-1 mm	(1bar)	30 mL/min

Other options (with different channels, pressure, flow rate...) are available on demand depending on the specific requirements.

3.1.2. Single & Dual Syringe Pumps LP series

Syringe pumps LP offer a suitable solution for high accuracy and small flow rate liquid transferring.




References	LSP01-1A	LSP01-2A	TJ-3A / W0109-1B	LSP02-1B
Syringe pump specifications				
» Working Mode:	Infusion		Infusion, withdrawal, infusion/withdrawal, withdrawal/infusion, continuous	
» Channels:	1		2	
» Pump stroke:	140 mm		90 mm	140 mm
» Advance per microstep:	0.156 μm	0.031 μm	0.165 μm	0.156 μm
» Max. linear rate:	65 mm/min	13 mm/min	79.4 mm/min	130 mm/min
» Min. linear rate:	5 μm/min	1 μm/min	7.94 μm/min	5 μm/min
» Linear force:	> 90 N		> 180 N	
» Accuracy:	≤ ± 0.5% error in the condition of > 30% of max. infusion distance			
» Flow rate:	0.83 nL/min – 54.2 mL/min	0.16 nL/min – 10.8 mL/min	0.139 μL/min – 52.9 mL/min	0.83 nL/min – 150.5 mL/min
» Syringe size:	10 μL – 60 mL		1 – 60 mL	10 μL – 140 mL
» Display setting:	Display volume, flow rate or linear speed (128x64 graphic LCD)			
» Power-off memory:	Storing the running parameters automatically			
» State signal output:	2 output signals (OC gate signal) to indicate start/stop and direction			
» Control signal input:	Falling edge or TLL signal to control start/stop			
» Comm. interface:	RS485			
» Power supply:	AC 90V-260V / 15W		AC 90V-260V / 10W	AC 90V-260V / 20W
» Operating temperature:	0 to 40 °C			
» Relative humidity:	< 80%			
» Dimensions (D X W X H):	280 x 210 x 140 mm		170 x 108 x 70 mm / 245 x 100x 95 mm (controller / drive unit)	280 x 250 x 140 mm
» Weight:	3.6 Kg		0.8 Kg (controller) 1.3 Kg (drive unit)	4.3 Kg

Other options (with different channels, precision, flow rate...) are available on demand depending on the specific requirements.



3.1.3. Single & Multi Syringe Pumps NE series

Syringe pumps NE provide a very affordable solution for fluids handling in multiple applications.

References	NE-300	NE-1000	NE-4000	NE-1600/1800/1200
Syringe pump specifications				
» Working Mode:	Infusion		infusion/withdrawal	
» Channels:	1	2	Up to 12	
» Motor type:	Step motor			
» Motor step per resolution:	400	200		
» Microstepping:	1/8 to 1/2 depending on motor speed			
» Advance per step:	0.2126 μm to 0.8504 μm depending on motor speed		0.4252 μm to 1.7009 μm depending on motor speed	0.1323 μm to 0.5292 μm depending on motor speed
» Maximum speed:	38 mm/min	51 mm/min	184 mm/min	35 mm/min
» Minimum speed:	0.7 μm/min		1.3 μm/min	0.4 μm/min
» Linear force:	> 150 N at minimum speed, 80 N at maximum speed		> 400 N at minimum speed, 80 N at maximum speed	> 700 N at minimum speed, 130 N at maximum speed
» Accuracy:	Within +/- 1% over length of syringe, exclusive of syringe variations			
» Flow rate:	12 nL/min – 20 mL/min	12 nL/min – 30 mL/min	25 μL/min – 100 mL/min	8 nL/min – 20 mL/min
» Syringe size:	1 – 60 mL (140 mL partially filled)			0.5 μL – 140 mL
» Number of program phases:	--	41		
» Comm. interface:	--	RS-232 (network up to100 pumps)		
» Power supply:	Unregulated linear external wall adapter, country and power source specific (or compatible regulated power supply)			
» Dimensions (D X W X H):	229 x 146 x 114 mm			260 x 381 x 127 mm
» Weight:	1.63 Kg			4.6 Kg

Other options (with different channels, precision, flow rate...) are available on demand depending on the specific requirements.

Accessories, such as syringes, cables, control software, etc..., are also available.

Note: Specifications subject to change without prior notice. **Not for Clinical Use On Humans.**




3.2. FLOW SYSTEM PACKS

MicruX provides different accessories usually required for using the standard thin-film (micro)electrodes in flowing liquids systems. Thus, MicruX has available different packs of accessories for using thin-film electrodes in flow system with the **electrochemical flow-cell** or **All-in-One platform**.

3.2.1. Basic fitting pack (*Ref. B-PACK*)

Part reference	Items	Amount
 008NF16-2100	Fitting nuts (1/4" - 28 UNF - 1/16" OD tubing)	1 pk (5 units)
 008FT16-2310	Ferrules PTFE/SS (1/4" - 28 UNF - 1/16" OD tubing)	1 pk (5 units)
 008T16-080-1	PTFE tubing (OD: 1,6mm - 1/16" - ID: 0,8 mm)	1 m
 140-015652	Plastic syringes (10 mL)	5 units
 9.409	Disposable scalpel	1 unit

3.2.2. Basic-Plus pack (*Ref. B-PACK+*)

Part reference	Items	Amount
 008NF16-2100	Fitting nuts (1/4" - 28 UNF - 1/16" OD tubing)	1 pk (5 units)
 008FT16-2310	Ferrules PTFE/SS (1/4" - 28 UNF - 1/16" OD tubing)	1 pk (5 units)
 008T16-080-1	PTFE tubing (OD: 1,6mm - 1/16" - ID: 0,8 mm)	1 m
 GL32	Glass reservoir (GL32 thread - 50 mL)	2 units
 0032t-2	Bottle cap (GL32 thread/ 2 x Luer ports)	2 units
 140-015652	Plastic syringes (10 mL)	5 units
 9.409	Disposable scalpel	1 unit

3.2.3. Full system pack (Ref. F-PACK)

Part reference	Items	Amount
 <i>ED-FLOW-CELL ED-AIO-CELL-2x</i>	Electrochemical Flow Cell or AIO platform (Drop + Flow-cell add-on)	1 unit
 <i>ED-TF-Electrodes</i>	Standard thin-film microelectrodes	25 units
 <i>LP-BT100-2J / DG-2(10)</i>	Peristaltic Tube Pump (two channels)	1 unit
 <i>SC00XX</i>	Standard peristaltic tubes (two different diameters)	10 units
 <i>7010 / 7012</i>	Injection valve (20 µL loop) with loop fill port	1 unit
 <i>008NF16-2100</i>	Fitting nuts (1/4" - 28 UNF - 1/16" OD tubing)	1 pk (5 units)
 <i>008FT16-2310</i>	Ferrules PTFE/SS (1/4" - 28 UNF - 1/16" OD tubing)	1 pk (5 units)
 <i>008T16-080-1</i>	PTFE tubing (OD: 1,6mm - 1/16" - ID: 0,8 mm)	1 m
 <i>GL32</i>	Glass reservoir (GL32 thread - 50 mL)	2 units
 <i>0032t-2</i>	Bottle cap (GL32 thread/ 2 x Luer ports)	2 units
 <i>140-015652</i>	Plastic syringes (10 mL)	5 units
 <i>9.409</i>	Disposable scalpel	1 unit
 <i>4.008 485</i>	Tweezers	1 unit
 <i>SP001</i>	Mounting brackets / panels	1 set

Other pack options; with different peristaltic or syringe pumps, additional accessories..., are also available on demand. Packs might be customized taking into account the specific requirements of customers.



3.3. DIGITAL MICROSCOPE

The Standalone Desktop LCD Digital Microscope (**Ref. SDM-1200x-LCD**) provides a great complement for a wide range of applications including inspection of electronics, microfluidic channels, electrodes, etc...

TECHNICAL FEATURES	
 	» Image Sensor: 5 MegaPixel (up to 12M by interpolation)
	» Controller: High Speed DSP
	» Flicker Rate: 50Hz/60Hz
	» Focus Range: Manual Focus From 10mm to 50mm
	» Light Source: 8 LEDS with Adjustable Brightness
	» Digital Magnification: Up to 1200x
	» Optical Magnification: 10x to 300x
	» Battery: Rechargeable 3.7V/1050 mAh Li-ion Battery
	» Working Time: 2 hours
	» Charge Time: 3 hours
	» Video Format: AVI
	» Video Resolution: VGA, QVGA - 30 fps
	» LCD Screen: 3.5" LCD screen, 4:3 ratio, resolution 320x240 pixels
	» OSD Languages: English, German, French, Spanish, Russian, Italian, Portuguese, Dutch, Polish, Japanese, Korean, Chinese
	» microSD Card: Up to 32GB microSDHC
	» TV Output: Available (to any monitor with TV in)
	» Dimensions: 22.9 x 15.2 x 15.2 cm
	» Weight: 0.9 Kg

The **Digital Microscope** operates completely standalone or compatible with PC, Mac and iPad (using iPad camera kit for image import). Up to **1200x magnified** and **LED illuminated** viewing, snapshot, filming and measurement calibration functions.

» Package Contents

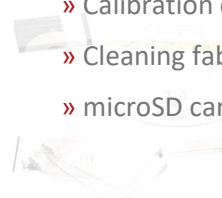
- » Digital Microscope
- » Quick Start Guide
- » Software CD



- » Battery
- » USB cable
- » TV cable



- » Calibration chart
- » Cleaning fabric
- » microSD card



3.4. OTHER ACCESSORIES & REAGENTS

MicruX provides any additional complementary tools as well as reagents necessities to suitable work with microfluidic devices, electrochemical sensors and portable analytical instrumentation.

» High voltage cable



» Ref. MXF-HVCAB

High voltage cable for using in combination with *MicruX*® HVStat to connect the HV electrodes.

Cable dimensions: 50 cm long

» Bipotentiostat cable



» Ref. MXF-BIPOTCAB

Bipotentiostat cable for using in combination with *MicruX*® HVStat to connect the electrodes of detection system.

Cable dimensions: 50 cm long

» REAGENTS – Buffer solution



» Ref. MXF-MES

Buffer substance provided as single dose specially developed to carry out electrophoresis separations in microfluidic devices with electrochemical detection. Buffer is available in different pH between 5.0 and 7.0.



Severo Ochoa Building · Floor -1 – Room 4 & 6
Julián Clavería s/n · 33006 · Oviedo (Asturias) · SPAIN

Phone/FAX: +34 984151019

E-mail: info@micruxfluidic.com

Web: www.micruxfluidic.com

