

## ELECTROCHEMICAL SENSOR

Type: AC1.W\*.R\* (\*)  $S_w = 6,8 \text{ mm}^2$

### Description

The sensor is formed on a corundum ceramic base. On to this surface the working, the reference and the auxiliary electrodes are applied. The working and the auxiliary electrodes are made of variety of materials. At the end of the sensor there is a contacting field which is connected with the active part by the silver conducting paths which are covered by a dielectric protection layer. A bio-chemically active substance can be immobilised on the working electrode of the sensor to create a biosensor. All sensors can be equipped with heating and temperature sensing elements. Thermistor (must be calibrated) or Pt 1000 (the response corresponds to the ISO standard) is used as the temperature sensor.

### Physical Parameters

#### Dimensions:

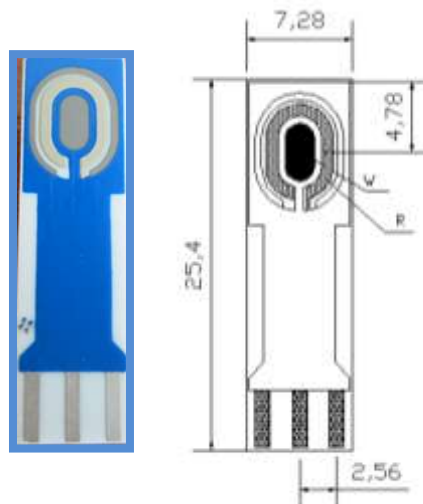
Weight: 0.5 gms  
Length: 25.40 mm  
Width: 7.26 mm  
Thickness: 0.63 mm

$A = 4.00 \pm 0.05 \text{ mm}$

$S_w = 6.80 \text{ mm}^2$

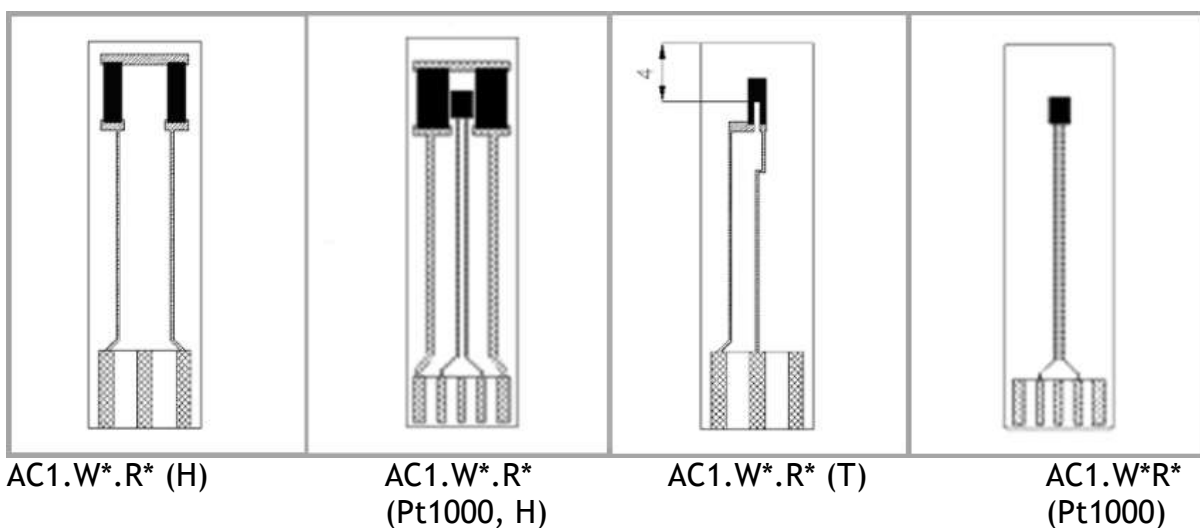
Electrode Materials are defined by:

AC1.W\*.R\* (\*)



The asterisk is replaced by the appropriate number or letter.

|                                                                                   |                                          |
|-----------------------------------------------------------------------------------|------------------------------------------|
| AC - Amperometric sensor or electrode on corundum ceramic base                    |                                          |
| AC1 - Sensor group reference number                                               |                                          |
| W - Working electrode material                                                    | R - Reference electrode material         |
| S - Alloy of Gold and Platinum                                                    | S - Silver                               |
| 1 - Pure Gold                                                                     | 1 - Silver / Silver Chloride             |
| 2 - Pure Platinum                                                                 | 2 - Silver covered by AgCl               |
| 3 - Pure Silver                                                                   | (*) - Additional Technical specification |
| 4 - Carbon(Graphite)                                                              | H - Heating of the sensor                |
| 5 - Manually Microdispensed Carbon(Graphite) with Au+Pt alloy auxiliary electrode | T - Temperature sensing element          |



### Heating parameters:

Maximum voltage is 35 V and temperature approximately 500°C, resistance: 800hm.

### Thermistor:

- 1) resistance paste - resistance 1600hm, coefficient K= 6100 ppm/K
- 2) Pt1000

### Evaluation units

- PalmSens
- eDAQ

### Connector types for AC1 sensors range

|               | KA1 | KA1.S | KA1.C | KA4 |
|---------------|-----|-------|-------|-----|
| AC1.W*.R*     | ✓   | ✓     | ✓     | ✓   |
| AC1.W*.R*(H)  |     |       |       | ✓   |
| AC1.W*.R* (T) |     |       |       | ✓   |

### Recommended Accessories

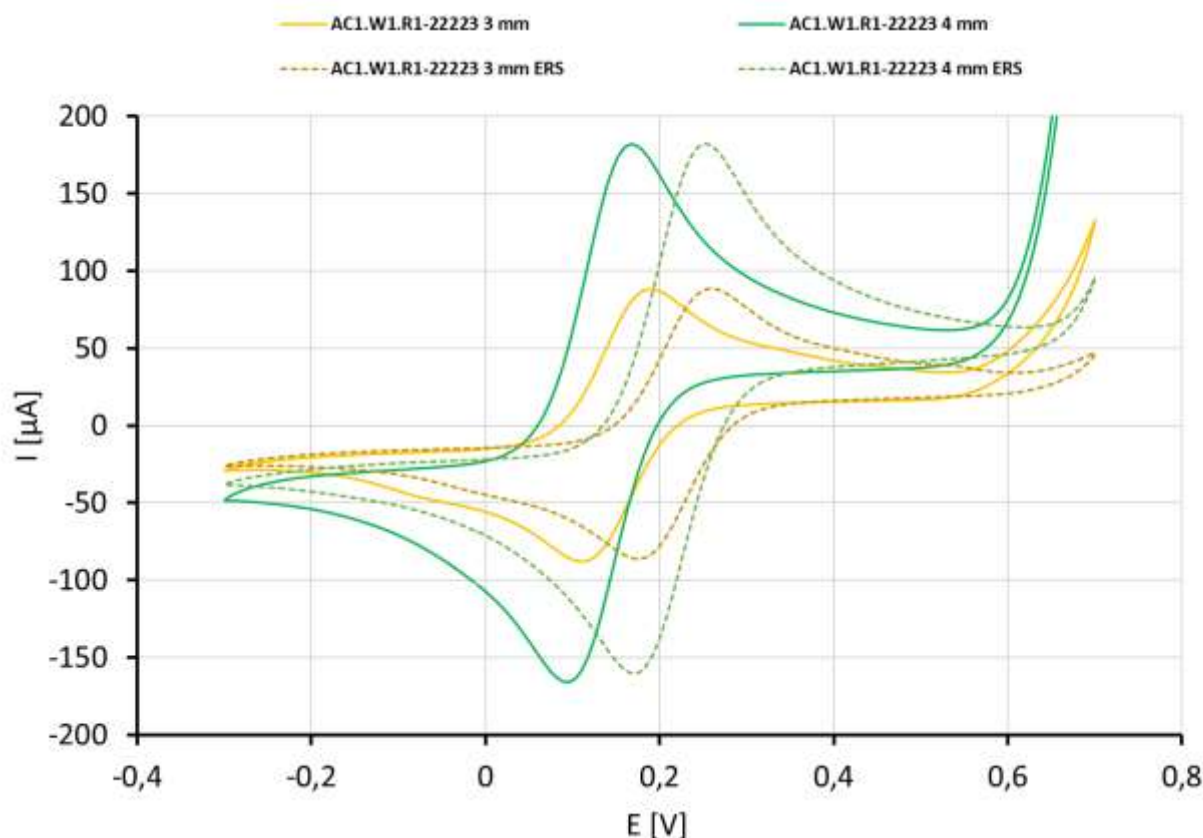
- FC2, FC4, TC4, TC5, TC6, MT

### Sensor Usage

The specific range of sensors enables the measurement of basic electrochemical and bio-electrochemical techniques.

## Typical Sensor Response

Comparison of sensor response with working electrode diameter 3 (6.8 mm<sup>2</sup>) and 4 mm

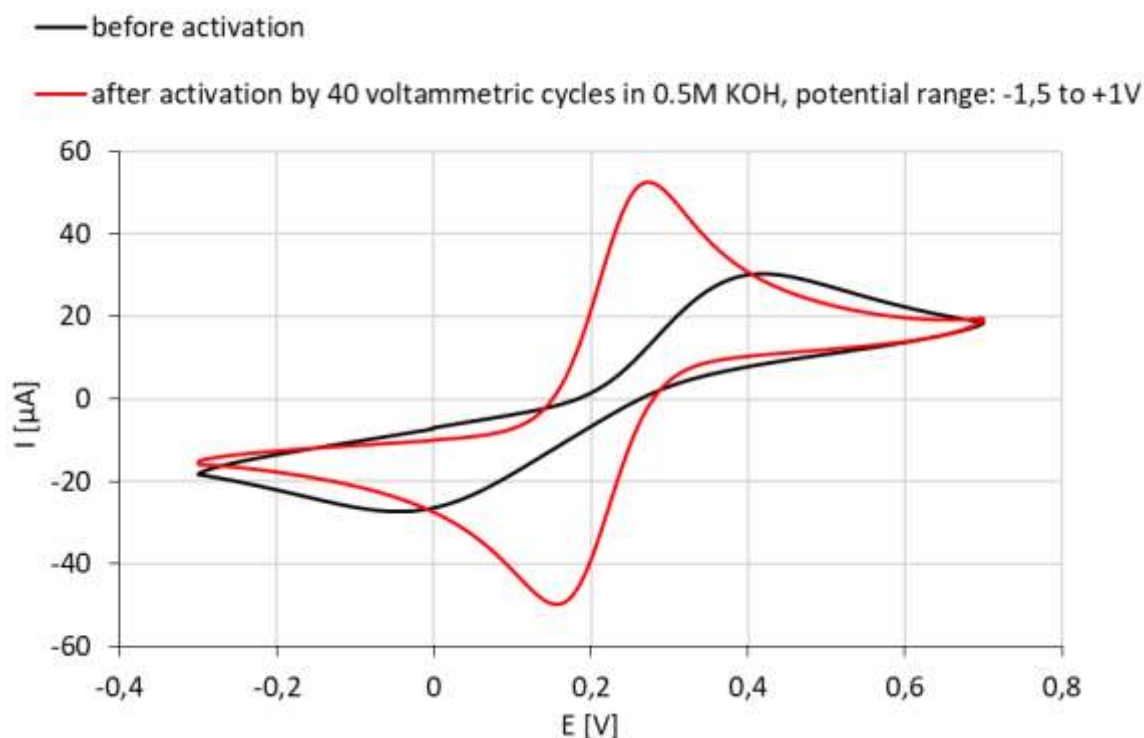


### Measurement specification:

- Cyclic voltammetry, scan rate: 50 mV/s, potential range: -0,3 to +0,7V
  - Temperature: 20 °C
  - Working electrode: sensor AC1.W1.R1, batch number 22223,  $D_w = 3$  mm  
sensor AC1.W1.R1, batch number 22223,  $D_w = 4$  mm
1. Measurement with ERS (external reference system)
    - Reference electrode: RCEc.RS.R5  
(external Ag/AgCl electrode (filled with 1M KCl))
    - Auxiliary electrode: ACEc  
(external Pt electrode)
  2. Measurement with sensor
    - The sensor's internal auxiliary and reference electrodes were used

## Activation

BVT offers unactivated versions of both W4 and W5 for standard tests and direct measuring. For specialised testing and more precise results it is recommended to have the W4 and W5 activated (the activation in most cases, is unique for each type of test being carried out). The activation can be carried out by BVT, based on your requirements (activation will have an additional cost, which varies based on the type of activation required).



### Measurement specification:

- Cyclic voltammetry, scan rate: 50 mV/s, potential range: -0,3 to +0,7V
- Temperature: 20 °C
- Sensors: AC1.W4.RS, batch number 19724,  $D_w = 2\text{mm}$  (before and after activation)

All measurements were performed with an external reference system and the standard BVT Connector:

- Reference electrode: RCEc.RS.R5  
(external Ag/AgCl electrode (filled with 1M KCl))
- Auxiliary electrode: ACEc  
(external Pt electrode)
- BVT Connector: KA1.1 (4mm Banana Plugs)  
(Note: Other output connections are available and the customer can choose which connection they will need as in our KA1.\* Data Sheet)

### Chemicals:

- FeFe: 0.005M  $\text{K}_3[\text{Fe}(\text{CN})_6]$  + 0.005M  $\text{K}_4[\text{Fe}(\text{CN})_6]$  in 0.2M KOH
- 0.5M KOH (for Carbon(Graphite) sensor activation)

## Related patents

PV 1994-864 (13.04.1994) utility design no. 6113/94

## References

- Jan Krejčí, Jan Prášek, Lukáš Fucik, Sameh Khatib, Edita Hejátková, Luboš Jakubka, Louisa Giannoudi, Screen-printed sensors with graphite electrodes – comparison of properties and physical method of sensitivity enhancement, *Microelectronics International*, 2004, Vol. 21 Issue: 3, pp.20-24, <https://doi.org/10.1108/13565360410549684>
- Andrew C. Barton, Stuart D. Collyer, Frank Davis, Davinia D. Gornall, Karen A. Law, Emma C.D. Lawrence, Daniel W. Mills, Suzy Myler, Jeanette A. Pritchard, Mark Thompson, Seamus P.J. Higson, Sonochemically fabricated microelectrode arrays for biosensors offering widespread applicability: Part I, *Biosensors and Bioelectronics*, Volume 20, Issue 2, 2004, Pages 328-337, ISSN 0956-5663, <https://doi.org/10.1016/j.bios.2004.02.002>.
- Jan Krejčí, Lucie Ježová, Radka Kučerová, Robert Plička, Štěpán Broža, David Krejčí, Iva Ventrubová, The measurement of small flow, *Sensors and Actuators A: Physical*, Available online 6 September 2017, ISSN 0924-4247, <https://doi.org/10.1016/j.sna.2017.08.050>.

## Ordering information

- The order is specified by whole sensor description formula
- Minimum order quantity - 20 sensors
- All order quantities are to be in multiples of 20 e.g. 20, 40, 60, etc.
- Delivery time for standard AC1 sensors is 4 weeks from receipt of order
- Delivery time for non-standard AC1 sensors depends on final technical specification of order (see customer screen printed electrode questionnaire)

## Examples of Order

- 100 pieces - AC1.W2.R1 Sw = 6,8 mm<sup>2</sup>
- 200 pieces - AC1.W3.RS (H) Sw = 6,8 mm<sup>2</sup>