IC Equipment set

Variocell for Bioscan – 6.5331.1X0

Manual

8.110.8009EN / 2019-09-25

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This documentation has been prepared with great care. However, errors can never be entirely ruled out. Please send comments regarding possible errors to the address above.

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1 Introduction

1.1 Description

The Variocell is an electrochemical flow cell with an exchangeable working electrode for usage in Bioscan instruments.

The Variocell is constructed in such a way that both of the eluent outlets can serve as either inlets or outlets.

The Variocell is available in four versions:

- Gold Variocell 6.1254.110
- Glassy-Carbon Variocell 6.1254.120
- Platinum Variocell 6.1254.130
- Silver Variocell 6.1254.140

A more detailed description of the specifications and areas of application for the individual cells can be found in the chapter *Technical specifications, page 12*.

1.2 About the documentation

CAUTION

Please read through this documentation carefully before putting the instrument into operation. The documentation contains information and warnings which the user must follow in order to ensure safe operation of the instrument.

1.2.1 Symbols and conventions

The following symbols and styles are used in this documentation:

*(5-**12**)*	**Cross-reference to figure legend** The first number refers to the figure number, the second to the instrument part in the figure.
1	**Instruction step** Carry out these steps in the sequence shown.
	**Warning** This symbol draws attention to a possible life hazard or risk of injury.

	**Warning** This symbol draws attention to a possible hazard due to electrical current.
	**Warning** This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	**Warning** This symbol draws attention to a possible biological hazard.
	**Caution** This symbol draws attention to a possible damage of instruments or instrument parts.
	**Note** This symbol marks additional information and tips.

2 Components and connectors

NOTICE

The Variocell is supplied fully mounted. Immediately after receipt, check whether the shipment has arrived complete and without damage by comparing the delivery note with the list of accessories .

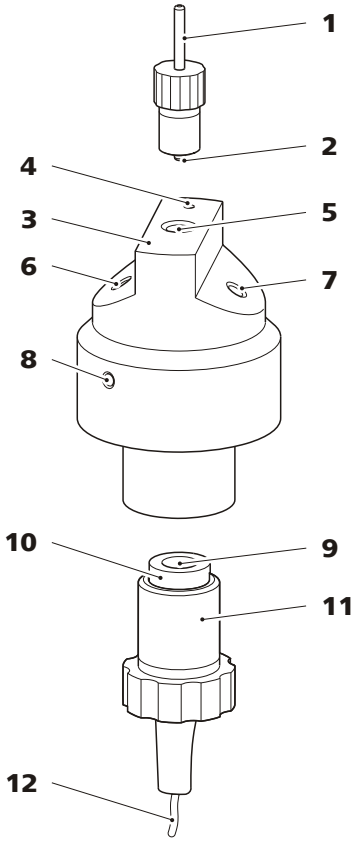

Figure 1 Components and connectors of the Variocell

1	**Reference electrode connector** For connecting the black 6.2156.000 electrode cable.	**2**	**Reference electrode**
3	**Auxiliary electrode**	**4**	**Auxiliary electrode connector** For connecting the blue 6.2156.000 electrode cable.

5 **Reference electrode reservoir**

6 **Eluent inlet**
For connecting the connection capillary using one of the 6.2744.014 pressure screws provided.

Can also be used as eluent outlet.

7 **Eluent outlet**
For connecting the 6.1803.030 PTFE capillary using one of the 6.2744.014 pressure screws provided.

Can also be used as eluent inlet. The **PTFE capillary** must however always be connected to the **eluent outlet.**

8 **Clamping screw**
For adjusting the auxiliary electrode holder when inserting the working electrode.

9 **Working electrode (exchangeable)**
Exchangeable electrode platelet.

10 **Auxiliary electrode holder**
Holder for working electrode.

11 **Fastening ring**
For fastening the working electrode holder.

12 **Working electrode connector**
For connecting the red 6.2156.000 electrode cable.

3 Installation

3.1 Installing the Variocell

CAUTION

Never switch the Variocell on, when...

- … it is not completely connected, or
- … if it is not simultaneously being rinsed by a conductive eluent.

The working electrode or other electronic components may be damaged.

Installing the Variocell

1 Removing the reference electrode

Unscrew the reference electrode.

Removing the reference electrode prior to the filling of the cell prevents air bubble formation while the reservoir is being filled.

2 Connecting the eluent inlet

Use a pressure screw 6.2744.014 to attach the column connection capillary (attached to the separation column) to the eluent inlet *(1-**6**)* of the Variocell.

In order to avoid dead volume while doing so, slide the capillary up to the stop in the cell and then rotate the pressure screw in until the capillary is fixed in place. Do not however tighten the pressure screw too much, as this could cause damage to the thread.

3 Connecting the eluent outlet

- Use a pressure screw 6.2744.014 to attach one end of the supplied PTFE capillary 6.1803.030 to the eluent outlet *(1-**7**)* of the Variocell.
  In order to avoid dead volume while doing so, slide the capillary up to the stop in the cell and then rotate the pressure screw in until the capillary is fixed in place. Do not however tighten the pressure screw too much, as this could cause damage to the thread.

- Guide the free end of the drainage capillary into a sufficiently large waste container and fasten it there.

4 Inserting the reference electrode

- Switch on the high pressure pump of the chromatography system. This will cause the reservoir of the reference electrode *(1-**5**)* to fill up.

NOTICE

The reservoir will overflow when the reference electrode is inserted. Keep paper towels close to hand.

- Insert the reference electrode into the filled reservoir and screw it on. Take care to allow air bubbles to escape from the reservoir.

5 Installing the Variocell

Place the Variocell into the measuring cell holder of the Bioscan.

Rotate the cell in its holder in such a way that the eluent outlet is located as high up as possible. This will allow any air bubbles which may appear to escape from the cell.

6 Connecting the electrode cable

- Connect the electrode cable 6.2156.000 to the Variocell using the three connector plugs (red - working electrode, blue - auxiliary electrode, black - reference electrode).
- Connect the other end to the connector of the 871 Advanced Bioscan.

3.2 Exchanging the auxiliary electrode

The Variocell is constructed in such a way that it can be utilized for a multitude of different applications. It need only be ensured that the correct working electrode is being utilized for the desired application.

Working electrodes have a front side and a rear side. The front side is polished smooth and glossy, while the rear side is more matte. "Au", "Ag" or "Pt" is also engraved on the rear side of working electrode plates made of gold, silver or platinum, respectively.

The working electrode must always be inserted with the smoothly polished, glossy side facing outward.

Proceed as follows to exchange the working electrode:

Dismantling the Variocell

1 Dismantling the Variocell

- In the software, switch off the Variocell and the high pressure pump.
- Dismantle all three electrode cables.
- Remove the Variocell from the holder in the instrument.
- Unscrew the eluent inlet and eluent outlet.

2 Removing the auxiliary electrode holder

- Unscrew the fastening ring *(1-**11**)* on the working electrode holder and remove it.
- Carefully pull the working electrode holder *(1-**10**)* out of the Variocell.

Exchanging the working electrode

1 Removing the old working electrode

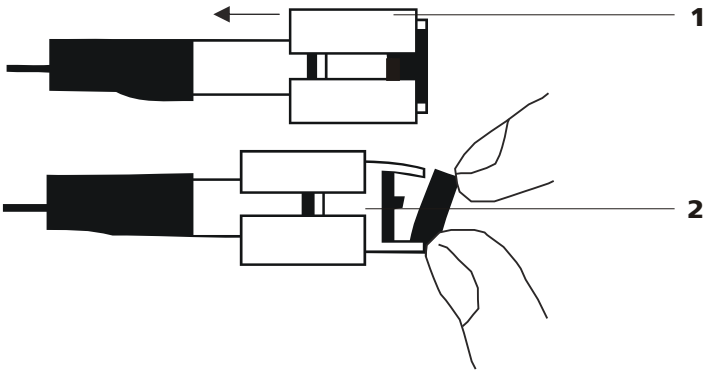

Figure 2 Remove the working electrode

1 Mounting ring

2 Silicone holder

Pull back the mounting ring *(2-**1**)* and use the tips of your fingers to remove the electrode from the silicone holder *(2-**2**)*.

NOTICE

Do not use any tools to remove the working electrode.

Using tools could cause the edges of the working electrode to become damaged, which might have an influence on the measuring results.

2 Inserting new working electrode

- Insert new working electrode *(1-**9**)* into the silicone holder *(2-**2**)* of the working electrode holder *(1-**10**)* with the polished side facing outward.
- Remove fingerprints with acetone or methanol.
- Secure the working electrode with the mounting ring *(2-**1**)*.

Reinstalling the Variocell

1 Mounting the working electrode holder

- Guide the working electrode holder into the Variocell aligning it with the clamping screw *(1-**8**)*.
- Pull the fastening ring *(1-**11**)* over the electrode cable and screw on just tightly enough to ensure that the working electrode holder is held firmly in place.

2 Installing the Variocell

Reinstall the Variocell in accordance with the instructions *Installing the Variocell, page 5*.

4 Maintenance - Taking out of operation

In principle, the Variocell is maintenance-free.

Contamination appearing after prolonged utilization could however influence the measuring result. If the measuring signal should exhibit excessive noise, then you can quite easily remove the Variocell and clean it. To do so, proceed in accordance with the following instructions:

4.1 Maintaining the Variocell

CAUTION

The Variocell may not be unscrewed as long as the working electrode is still mounted.

The spacer could become damaged.

Proceed as follows to dismantle the Variocell:

Dismantling the Variocell

1. In the software, switch off the Variocell and the high pressure pump.
2. Dismantle all three electrode cables.
3. Remove the Variocell from its holder in the instrument.
4. Unscrew the eluent inlet and eluent outlet.
5. - Unscrew the fastening ring *(1-**11**)* on the working electrode holder and remove it.
   - Carefully pull the working electrode holder *(1-**10**)* out of the Variocell.
6. Only now, unscrew the two pieces of the variocell.

Cleaning the components of the Variocell

1 Cleaning the spacer

- Remove the spacer.
- Rinse with ultra pure water and dry.

2 Clean the auxiliary electrode

- Carefully clean the auxiliary electrode *(1-**3**)* with a soft cloth soaked with acetone or methanol.
  Avoid any use of force while doing so; the electrode could become damaged.
- Rinse off the interior side of the cell with ultra pure water and dry thoroughly.

3 Cleaning the working electrode

See also *(see figure 2, page 7)*.

- Remove the working electrode *(1-**9**)* from the working electrode holder *(1-**10**)*.
  To do so, pull back the mounting ring *(2-**1**)* and use the tips of your fingers to remove the electrode from the silicone holder *(2-**2**)*.
  Do not use any tools to remove the working electrode. Using tools could cause the edges of the working electrode to become damaged, which might have an influence on the measuring results.
- For the cleaning sequence, please follow the instructions contained in the chapter entitled *Cleaning the working electrode* in the 871 Advanced Bioscan manual.

Mounting the Variocell

1 Assembling the Variocell

CAUTION

Make sure that ...

- … the spacer is undamaged and
- … the surfaces of the spacer are dry and free of dust.

Remove fingerprints with acetone or methanol.

- Insert spacer.
- Screw together the two pieces of the Variocell.

2 Inserting the working electrode

NOTICE

Working electrodes have a front side and a rear side. The front side is polished smooth and glossy, while the rear side is more matte. "Au", "Ag" or "Pt" is also engraved on the rear side of working electrode plates made of gold, silver or platinum, respectively.

The working electrode must always be inserted with the smoothly polished, glossy side facing outward.

- Insert the working electrode *(1-**9**)* into the silicone holder *(2-**2**)* of the working electrode holder *(1-**10**)* with the polished side facing outward.
- Remove fingerprints with acetone or methanol.
- Secure the working electrode with the mounting ring *(2-**1**)*.
- Guide the working electrode holder into the Variocell aligning it with the clamping screw *(1-**8**)*.
- Pull the fastening ring over the electrode cable and screw on just tightly enough to ensure that the working electrode holder is held firmly in place.

3 Installing the Variocell

Install the cleaned Variocell back in the 871 Advanced Bioscan. To do so, follow the instructions in *chapter Installing the Variocell, page 5*.

4.2 Taking the cell out of operation

CAUTION

The Variocell should be cleaned and stored in its original packaging when not in use.

5 Technical specifications

5.1 General

Structure	Flow cell with working, reference and auxiliary electrode.
Cell volume	0.7 µL with the supplied 50 µm spacer.
Working temperature	The cell should not be operated continuously over 45 °C.
Reference electrode	
Type	Solid phase reference electrode
Conversion to Ag/AgCl	$E_{Hy\text{-}REF}$ /mV = $E_{Ag/AgCl}$ /mV – 328 + 29.9 pH (mV)

5.2 Gold Variocell

Working electrode	
Material	Gold
Applications	Sugar and amino acids ▪ Mono-, di-, oligo- and polysaccharides ▪ Sugar alcohols ▪ Sugar amines ▪ Sugar acids ▪ Amino acids ▪ Antibiotics
Working area	
Acid medium	-0.35 V…+1.1 V
Alkaline medium	-1.25 V…+0.75 V

5.3 Glassy-Carbon Variocell

Working electrode

Material	Glassy-Carbon
Applications	Aromatics and amines ▪ Catecholamines, aromatic amines ▪ Inorganic ions (nitrite, sulfite, ...) ▪ Phenols ▪ Vitamins ▪ Some amino acids

Working area

Acid medium	-0.8 V… +1.3 V
Alkaline medium	-1.5 V… +0.6 V

5.4 Platinum Variocell

Working electrode

Material	Platinum
Applications	Special applications ▪ Alcohols ▪ Glycols ▪ Hydrogen peroxide ▪ Hydrazine ▪ Arsenite, hypochlorite

Working area

Acid medium	-0.2 V… +1.3 V
Alkaline medium	-0.9 V… +0.65 V

5.5 Silver Variocell

Working electrode

Material	Silver
Applications	Applications relevant to the environment ▪ Halogenides ▪ Cyanide, sulfide ▪ Thiosulphate ▪ Pharmaceutics

Working area

Acid medium	-0.55 V… +0.4 V
Alkaline medium	-1.2 V… +0.1 V

6 Accessories

Up-to-date information on the scope of delivery and optional accessories for your product can be found on the Internet. You can download this information using the article number as follows:

Downloading the accessories list

1. Enter *https://www.metrohm.com/* into your Internet browser.
2. Enter the article number (e.g. **6.5331.1X0**) into the search field.
   The search result is displayed.
3. Click on the product.
   Detailed information regarding the product is shown on various tabs.
4. On the **Included parts** tab, click on **Download the PDF**.
   The PDF file with the accessories data is created.

NOTICE

Once you have received your new product, we recommend downloading the accessories list from the Internet, printing it out and keeping it together with the manual for reference purposes.

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