

884 Professional VA



Manual – Short Instructions

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1 Introduction

1.1 About these short instructions

This short instruction manual contains important chapters from the comprehensive manual. In addition to an introduction, safety instructions and an overview of the instrument, you will also find information about installing, starting up and servicing the 884 Professional VA instrument. The comprehensive manual can be downloaded as a PDF file from the Internet.

Downloading the manual

The detailed **8.884.8003EN** manual is available on the [Metrohm website](#):

- 1 Enter <https://www.metrohm.com/> into your Internet browser.
- 2 Enter the article number of the instrument (e.g. **2.884.XX10**) 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 Click on the **Documents** tab.
All available documents for the instrument will be displayed.
- 5 Click on the PDF link to download the desired 8.884.8003EN manual.

The 884 Professional VA instrument must be started, operated and controlled via the **viva** computer software. The data transfer between the measuring instrument and the computer takes place via a USB connection. At the end of every determination, the data (voltammogram, results, etc.) is saved in a database.

This manual describes the hardware of the 884 Professional VA instrument (installation, start-up, etc.). Operation with the **viva** computer software is described in the software documentation (online help and VA/CVS tutorials). The *Multi-Mode Electrode pro* document (8.110.8018XX) describes how to handle the Multi-Mode Electrode pro (MME pro). The *Leaflet 6.1241.090 Electrode shaft for screen-printed electrodes (SPE)* document (8.0109.8014EN) describes how to handle the screen-printed electrode (SPE).

1.3 Instrument versions

The **884 Professional VA** instrument is available in the following versions:

2.884.0010	Professional VA	without measuring head
2.884.0110	Professional VA manual for MME	with MME measuring head
2.884.0210	Professional VA manual for CVS	with CVS measuring head
2.884.1110	Professional VA semiautomated for MME	with MME measuring head and 2 Dosinos
2.884.1210	Professional VA semiautomated for CVS	with CVS measuring head and 2 Dosinos



NOTICE

The accessories for a given model version can be created as a PDF list on the Internet (*see chapter 8, page 113*).



1.4 Intended use

The 884 Professional VA, in combination with the MME measuring head, the RDE measuring head or the SPE measuring head is designed for voltammetric/polarographic determination of samples in the area of trace analysis. The following are potential application areas:

- Determination of transition metals using polarography or stripping voltammetry
- Speciation analysis



NOTICE

SPEs are not resistant to solvents. Do not use organic solvents for measurements or cleaning.

The 884 Professional VA, in combination with the RDE measuring head, has been designed for use in the analysis of electroplating baths for the quantitative determination of organic additives. The main fields of application are the following electroplating bath types:

- Acidic copper baths
- Tin baths
- Tin-lead baths
- Alkaline zinc baths
- Nickel baths

This instrument is suitable for processing various chemicals and flammable samples. Usage of the 884 Professional VA therefore requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge regarding the application of fire prevention measures prescribed for laboratories is also mandatory.

Before performing an analysis, the user should get acquainted with the hazard and precautionary statements or the risk and safety phrases that are valid for the chemicals used. The user should also observe the precautionary measures prescribed.

1.5 About the documentation



CAUTION

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.

1.5.1 Figures

The instrument can be used for both VA trace analysis (with an MME, RDE or SPE measuring head) and additive determination using CVS (with an RDE measuring head). The installation of all 3 measuring heads on the instrument is described separately in this documentation. For the sake of simplicity, in all other figures only one version of the measuring head is shown. In those cases, the content displayed also applies the same to the other measuring heads.

1.5.2 Further information and literature







Further information regarding the 884 Professional VA is available in the following publications:

- CVS tutorial (8.103.8010XX)
- VA tutorial (8.103.8033XX)
- "Electrodes in Voltammetry" multimedia guide (A.717.0003)
- Online help for computer software **viva**
- "Voltammetric analysis methods in electroplating" monograph (8.108.5002XX)
- Multi-Mode Electrode pro (8.110.8018XX)
- Mercury Handling Guidelines (8.000.5054XX)

1.5.3 Symbols and conventions

The following symbols and formatting may appear in this documentation:

<i>(5-12)</i>	<p>Cross-reference to figure legend</p> <p>The first number refers to the figure number, the second to the instrument part in the figure.</p>
1	<p>Instruction step</p> <p>Perform the steps one after the other.</p>
Method	Dialog text, parameter in the software
File ► New	Menu or menu item

[Continue]	Button or key
	<p>WARNING</p> <p>This symbol draws attention to a possible life-threatening hazard or risk of injury.</p>
	<p>WARNING</p> <p>This symbol draws attention to a possible hazard due to electrical current.</p>
	<p>WARNING</p> <p>This symbol draws attention to a possible hazard due to heat or hot instrument parts.</p>
	<p>WARNING</p> <p>This symbol draws attention to a possible biological hazard.</p>
	<p>CAUTION</p> <p>This symbol draws attention to possible damage to instruments or instrument parts.</p>
	<p>NOTE</p> <p>This symbol highlights additional information and tips.</p>

1.5.4 References

3 different measuring heads are described in this manual. In the chapter 4 *Start-up*, only one measuring head type is shown as an example. The content displayed also applies the same to the other measuring heads.

References to figures or descriptions lead to the chapter of the measuring head that is explicitly shown. If you are using a different measuring head, navigate to the corresponding chapter for the measuring head used via the table of contents. The measuring head chapters all have the same structure. If the chapter 2.3.1 "MME measuring head overview" is referred to, for example, then the respective information for the RDE measuring head can be found under 2.4.1 and for the SPE measuring head under 2.5.1.

1.6 Safety instructions

1.6.1 General notes on safety



WARNING

Operate this instrument only according to the information contained in this documentation.

This instrument left the factory in a flawless state in terms of technical safety. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

1.6.2 Flammable solvents and chemicals



WARNING

All relevant safety measures are to be observed when working with flammable solvents and chemicals.

- Set up the instrument in a well-ventilated location (e.g. fume cupboard).
- Keep all sources of flame far from the workplace.
- Clean up spilled liquids and solids immediately.
- Follow the safety instructions of the chemical manufacturer.

1.6.3 Electrical safety

The electrical safety when working with the instrument is ensured as part of the international standard IEC 61010.



WARNING

Only personnel qualified by Metrohm are authorized to carry out service work on electronic components.



WARNING

Never open the housing of the instrument. The instrument could be damaged by this. There is also a risk of serious injury if live components are touched.

There are no parts inside the housing which can be serviced or replaced by the user.

Supply voltage



WARNING

An incorrect supply voltage can damage the instrument.

Only operate this instrument with a supply voltage specified for it (see rear panel of the instrument).

Protection against electrostatic charges



WARNING

Electronic components are sensitive to electrostatic charges and can be destroyed by discharges.

Do not fail to pull the power cord out of the power socket before you set up or disconnect electrical plug connections at the rear of the instrument.

1.6.4 Personnel safety



WARNING

Handling hazardous substances

Hazardous substances may result in injuries.

Wear protective glasses and work clothes suitable for laboratory work.



WARNING

Uncontrolled splashing of reagents

Splashing reagents may result in injuries.

Operate the 884 Professional VA only with the measuring head in place and the measuring head arm lowered.

1.6.5 Metallic liquid mercury



WARNING

Mercury is a heavy liquid metal. Highly toxic mercury vapor forms even at room temperature. Breathing in mercury vapor poses the risk of chronic mercury poisoning. Therefore, observe the following points when handling a MME pro containing mercury:

- Do not inhale mercury vapor.
- Only work with open containers of mercury while under a fume cupboard.
- Avoid skin contact with mercury.
- Never store mercury in open containers.
- Keep the laboratory area for work involving mercury well-ventilated.
- Use amalgamation to bind any spilled mercury. Never use a broom or vacuum.
- Only have mercury disposed of by a professional. Never dispose of mercury in household or domestic waste.



NOTICE

For detailed information, observe the *Mercury Handling Guidelines* (8.000.5054XX).

1.6.6 Tubing and capillary connections



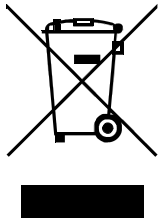
CAUTION

Leaks in tubing and capillary connections are a safety risk. Tighten all connections well by hand. Avoid applying excessive force to tubing connections. Damaged tubing ends lead to leakage. Appropriate tools can be used to loosen connections.

Check the connections regularly for leakage. If the instrument is used mainly in unattended operation, then weekly inspections are mandatory.



1.6.7 Recycling and disposal



This product is covered by European Directive 2012/19/EU, WEEE – Waste Electrical and Electronic Equipment.

The correct disposal of your old instrument will help to prevent negative effects on the environment and public health.

More details about the disposal of your old instrument can be obtained from your local authorities, from waste disposal companies or from your local dealer.

The MME pro (Multi-Mode Electrode pro) contains toxic mercury; never dispose of it in domestic waste. For more information on the recycling and disposing of mercury, observe the *Mercury Handling Guidelines* (8.000.5054XX).

2 Overview of the instrument

The following figures provide a detailed overview of the parts of the 884 Professional VA.

2.1 Front

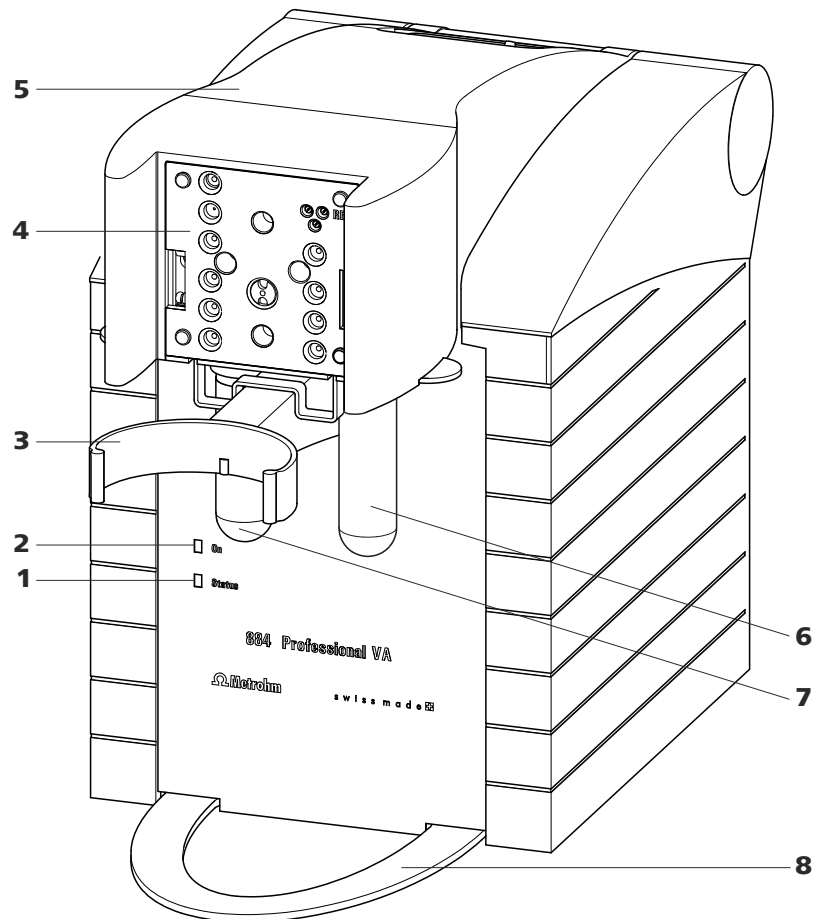


Figure 1 Front 884 Professional VA

1 "Status" LED

Continuously on: instrument ready for operation. Blinking regularly: instrument operating. Blinking pattern "LED on a long time - off a short time - on a long time - off a short time, etc.": Standby potential is being applied to the electrodes. Do not remove the electrode cables!

2 "On" LED

Illuminated if the 884 Professional VA is connected to the power grid.



<p>3 Holder for measuring vessel For inserting the measuring vessel.</p>	<p>4 Connector plate measuring head arm For inserting the measuring head.</p>
<p>5 Measuring head arm (tiltable)</p>	<p>6 Gas washing glass (6.2405.030) For wetting the inert gas.</p>
<p>7 Decanting glass (6.2405.030) For the deposition of solid materials that may be present (such as electrode mercury) in fully automated mode.</p>	<p>8 Holder for drip pan For positioning the drip pan.</p>

2.2 Rear

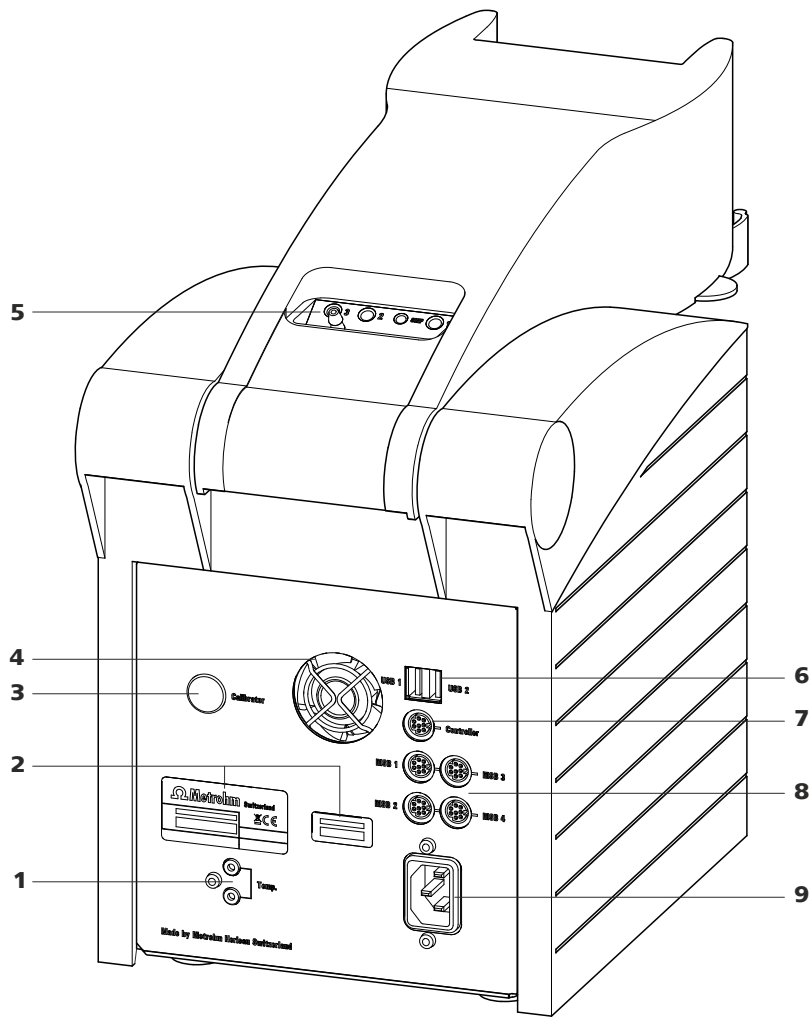


Figure 2 884 Professional VA rear

<p>1 Temperature sensor connector (Temp.) For connecting a temperature sensor of the type Pt1000. 2 B sockets, 2 mm.</p>	<p>2 Type plates With serial number.</p>
---	---



3 Calibrator For service procedures carried out by Metrohm.	4 Fan Runs during operation.
5 Tubing connector (measuring head arm) <i>See Chapter 2.3.3, page 18.</i>	6 USB connectors (USB 1 and USB 2), type A For connecting barcode readers, keyboards, etc.
7 "Controller" connector For connecting to a PC with the viva computer software installed. Mini DIN, 8-pin.	8 MSB connectors (MSB 1 to 4) Metrohm Serial Bus. For connecting dosing devices (800 Dosino) and Remote Boxes. Mini DIN, 8-pin.
9 Power socket	



2.3 MME measuring head

2.3.1 MME measuring head overview

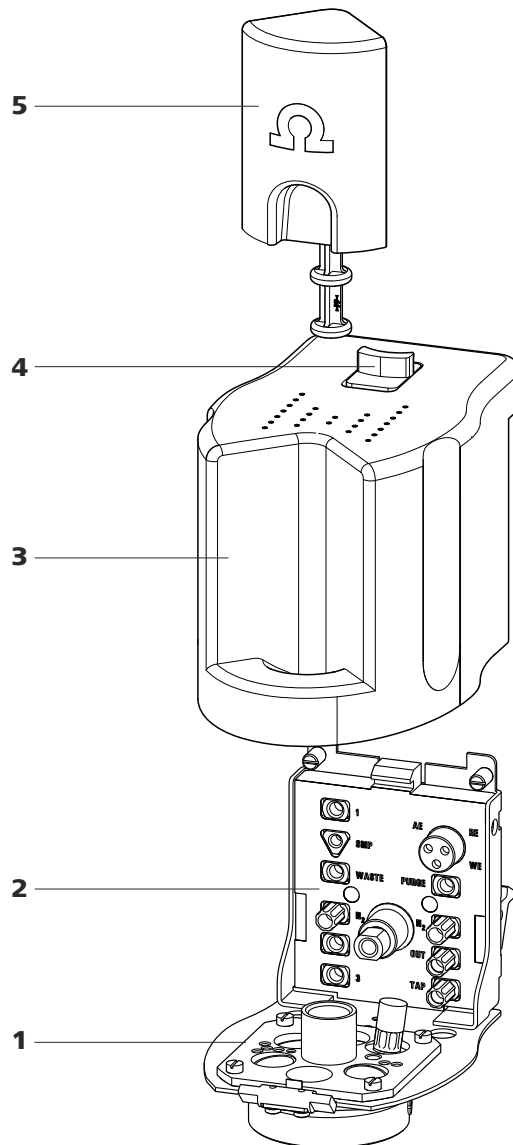


Figure 3 MME measuring head - Overview

1 Measuring head insert

With openings for inserting electrodes and tubing connections (see figure 5, page 17).

2 Measuring head connector plate

For connecting the MME measuring head to the connector plate of the measuring head arm (1-4).

For connecting the electrodes and tubing (see figure 4, page 15).

3 Measuring head cover
For shielding against electromagnetic interference.

4 Slide lock
For measuring head cover.

5 Stopper (6.2709.100)
For closing the pipetting opening (5-22).

2.3.2 MME measuring head connector plate and measuring head insert

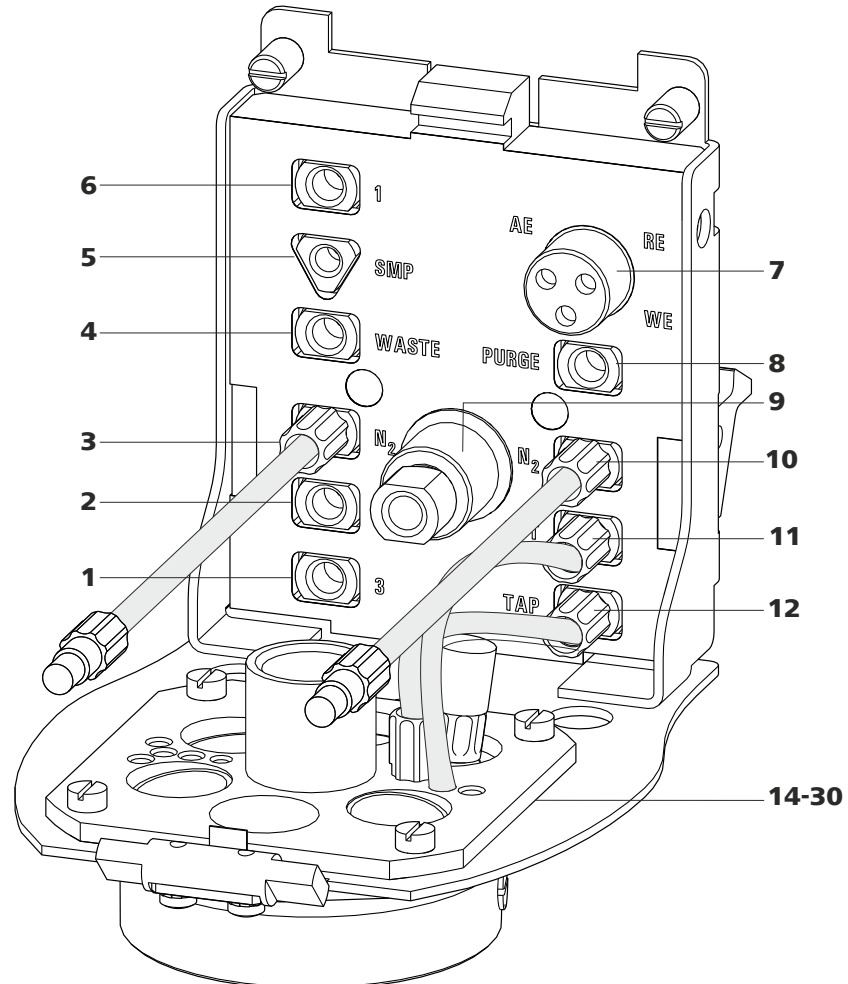


Figure 4 MME measuring head connector plate

1 M6 threaded opening (3)
For adding solutions. Can be connected to one of the openings **24 - 27** (FEP tubing from 6.1829.070).

2 M6 threaded opening (2)
For adding solutions. Can be connected to one of the openings **24 - 27** (FEP tubing from 6.1829.070).

3 M6 threaded opening (N₂)
For connecting the inert gas supply (N₂). Connected directly to the working electrode. The tubing comes pre-installed.

4 M6 threaded opening (WASTE)
For aspirating the measuring solution. Can be connected to one of the openings **24 - 27** (FEP tubing from 6.1829.070).



5 UNF 10/32 threaded opening (SMP)
For the automated sample addition. Must be connected to opening **28** (PEEK capillary 6.1831.020).

7 Electrode connector (AE, RE, WE)
With electrode cables, for connecting electrodes.

9 Flexible drive shaft for the stirrer

11 M6 threaded opening (OUT)
With preinstalled tubing connection to opening **18** - gas outlet.

14 - 30: see next figure

6 M6 threaded opening (1)
For adding solutions. Can be connected to one of the openings **24 - 27** (FEP tubing from 6.1829.070).

8 Threaded opening (PURGE)
For tubing connection to opening **19** - gas inlet in the measuring solution.

10 M6 threaded opening (N₂)
For connecting the inert gas supply (N₂). Connected directly to the working electrode. The tubing comes pre-installed.

12 M6 threaded opening (TAP)
With preinstalled tubing connection to threaded opening **17** - gas inlet to the tapping mechanism.

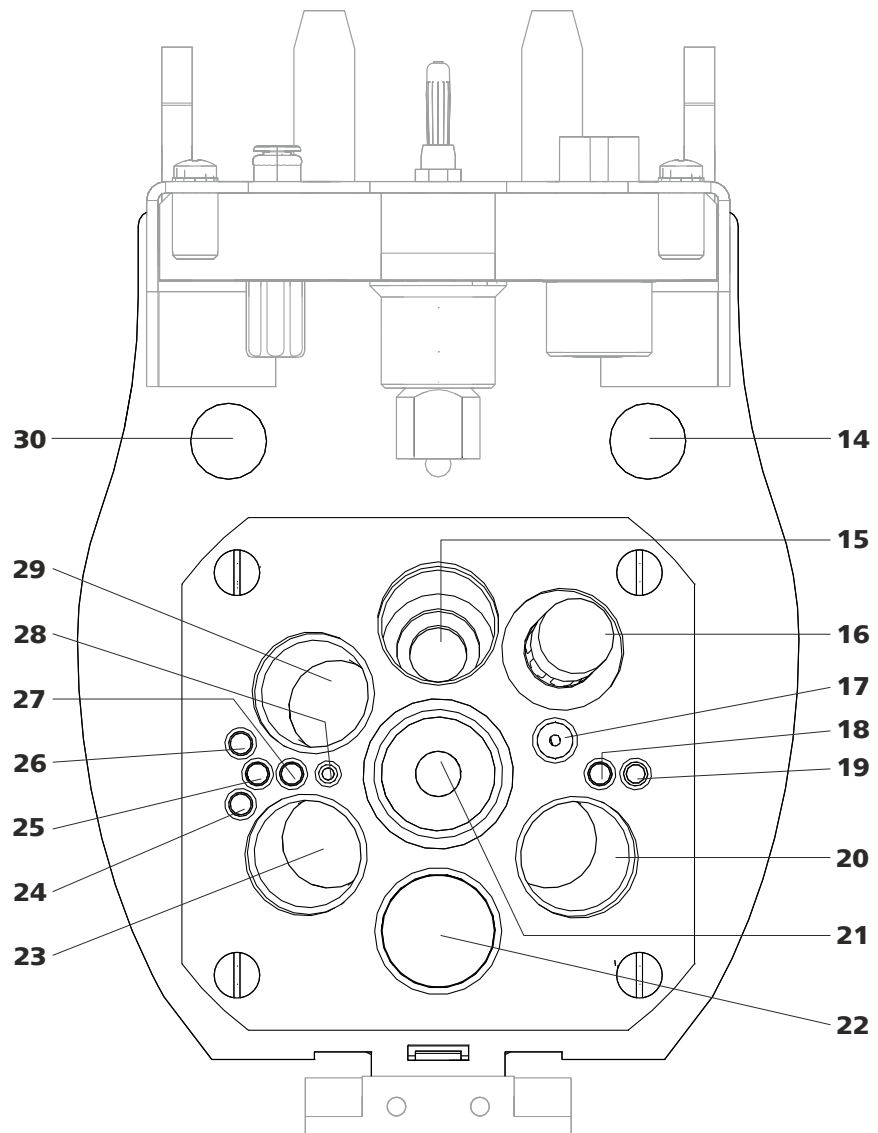


Figure 5 MME measuring head insert

14 Opening

For feeding through a four-way micro dosing tip (6.1824.000) from below.

16 Threaded opening

With preinstalled screw nipple and stopper. Can be equipped with a four-way micro dosing tip (6.1824.000).

18 Opening

With preinstalled tubing connection to threaded opening **11** (OUT) - gas outlet.

15 Opening

For positioning the stirrer.

17 M6 threaded opening

With preinstalled tubing connection to threaded opening **12** (TAP) - gas inlet to the tapping mechanism.

19 Opening

For tubing connection to threaded opening **8** (PURGE) - gas inlet in the measuring solution.



<p>20 Opening for electrode For inserting the reference electrode (RE).</p>	<p>21 Opening for electrode For inserting the Multi-Mode Electrode (working electrode - WE).</p>
<p>22 Pipetting opening For manually dosing solutions. Is closed with a 6.2709.100 stopper (3-5).</p>	<p>23 Opening for electrode For inserting the auxiliary electrode (AE).</p>
<p>24 Opening For adding or aspirating solutions. Can be connected with threaded opening 1, 2, 3 or WASTE (FEP tubing from 6.1829.070).</p>	<p>25 Opening For adding or aspirating solutions. Can be connected with threaded opening 1, 2, 3 or WASTE (FEP tubing from 6.1829.070).</p>
<p>26 Opening For adding or aspirating solutions. Can be connected with threaded opening 1, 2, 3 or WASTE (FEP tubing from 6.1829.070).</p>	<p>27 Opening For adding or aspirating solutions. Can be connected with threaded opening 1, 2, 3 or WASTE (FEP tubing from 6.1829.070).</p>
<p>28 Opening For the automated sample addition. Must be connected to threaded opening 5 (SMP) (PEEK capillary 6.1831.020).</p>	<p>29 Opening for sensor For inserting a temperature sensor (Pt1000).</p>
<p>30 Opening For feeding through the temperature sensor cable from above.</p>	

2.3.3 Tubing connector (measuring head arm)

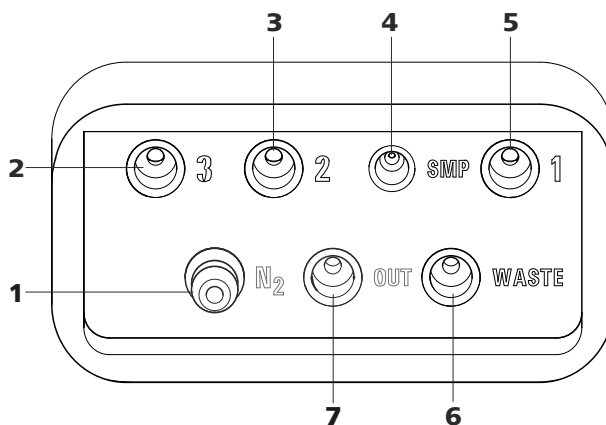


Figure 6 Tubing connector (measuring head arm)

<p>1 Nipple (N₂) For connecting the inert gas supply. Is connected to threaded openings TAP, PURGE and N₂ via the measuring head arm.</p>	<p>2 M6 threaded opening (3) For connecting tubing for adding solutions.</p>
<p>3 M6 threaded opening (2) For connecting tubing for adding solutions.</p>	<p>4 UNF 10/32 threaded opening (SMP) For connecting a capillary for automated sample addition.</p>

.....

5 M6 threaded opening (1)
For connecting tubing for adding solutions.

7 M6 threaded opening (OUT)
For pressure compensation in the measuring vessel.

6 M6 threaded opening (WASTE)
For connecting tubing for aspirating the measuring solution.



2.4 RDE measuring head

2.4.1 RDE measuring head overview

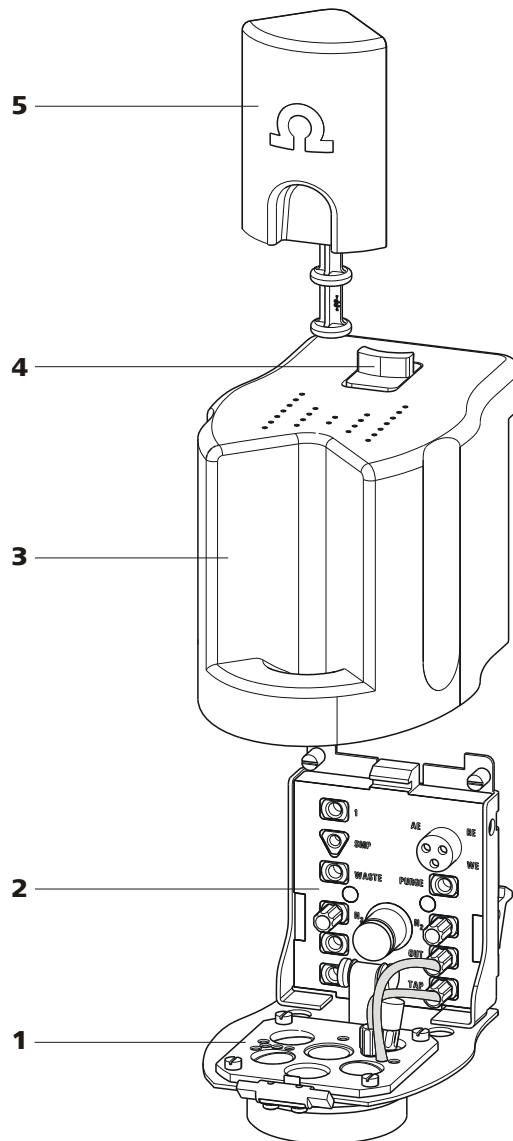


Figure 7 RDE measuring head - Overview

1 Measuring head insert

With openings for inserting electrodes and tubing connections (see figure 9, page 23).

2 Measuring head connector plate

For connecting the RDE measuring head to the connector plate of the measuring head arm (1-4).

For connecting the electrodes and tubing (see figure 8, page 21).

3 Measuring head cover
For shielding against electromagnetic interference.

4 Slide lock
For measuring head cover.

5 Stopper (6.2709.100)
For closing the pipetting opening (9-22).

2.4.2 RDE measuring head connector plate and measuring head insert

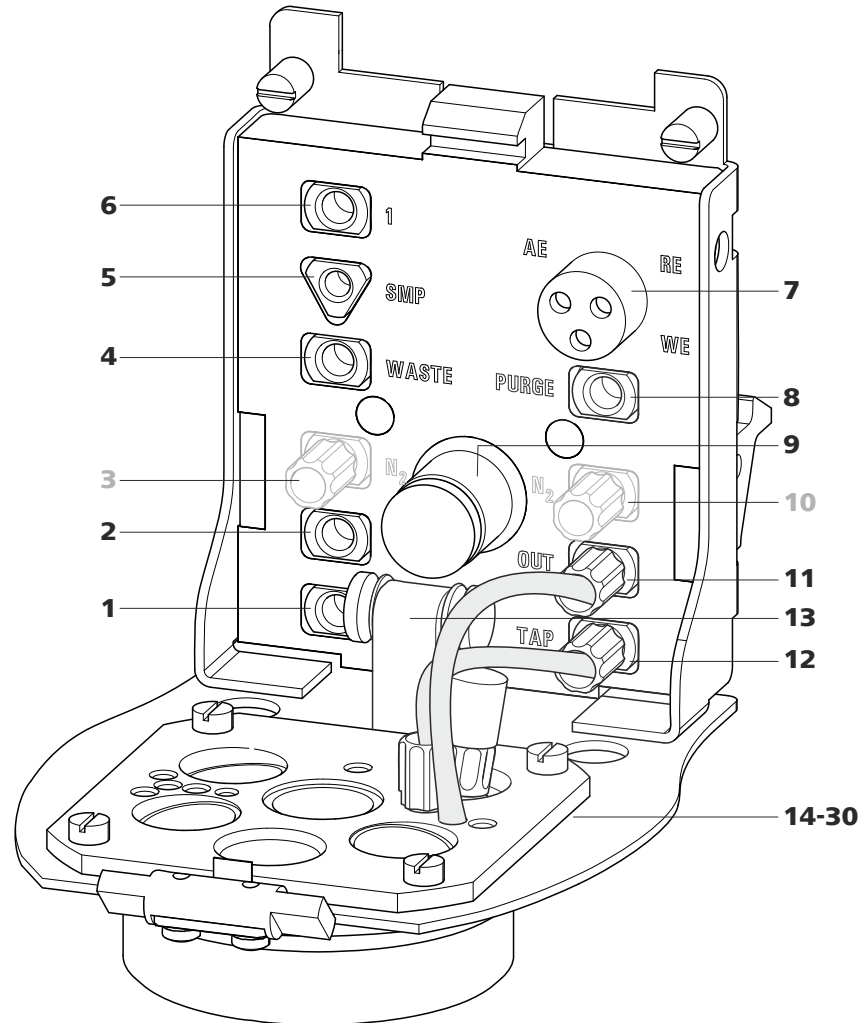


Figure 8 RDE measuring head connector plate

1 M6 threaded opening (3)
For adding solutions. Can be connected to one of the openings **24 - 27** (FEP tubing from 6.1829.070).

2 M6 threaded opening (2)
For adding solutions. Can be connected to one of the openings **24 - 27** (FEP tubing from 6.1829.070).

3 M6 threaded opening (N₂)
With preinstalled stopper. *Not applicable to CVS analyses and RDE applications in VA trace analysis.*

4 M6 threaded opening (WASTE)
For aspirating the measuring solution. Can be connected to one of the openings **24 - 27** (FEP tubing from 6.1829.070).

**5 UNF 10/32 threaded opening (SMP)**

For the automated sample addition. Must be connected to opening **28** (PEEK capillary 6.1831.020).

7 Electrode connector (AE, RE, WE)

With electrode cables, for connecting electrodes.

9 Drive shaft for rotating disk electrode (RDE)**11 M6 threaded opening (OUT)**

With preinstalled tubing connection to opening **18** - gas outlet. *For voltammetric applications, not applicable to CVS analyses.*

13 Guide roller

Transfers the rotary movement of the motor to the driving axle of the working electrode.

6 M6 threaded opening (1)

For adding solutions. Can be connected to one of the openings **24 - 27** (FEP tubing from 6.1829.070).

8 Threaded opening (PURGE)

For tubing connection to opening **19** - gas inlet in the measuring solution. *For voltammetric applications, not applicable to CVS analyses.*

10 M6 threaded opening (N₂)

With preinstalled stopper. *Not applicable to CVS analyses and RDE applications in VA trace analysis.*

12 M6 threaded opening (TAP)

With preinstalled tubing connection to threaded opening **17** - gas inlet via the measuring solution for keeping out oxygen during the measurement. *For voltammetric applications, not applicable to CVS analyses.*

14 - 30: see next figure

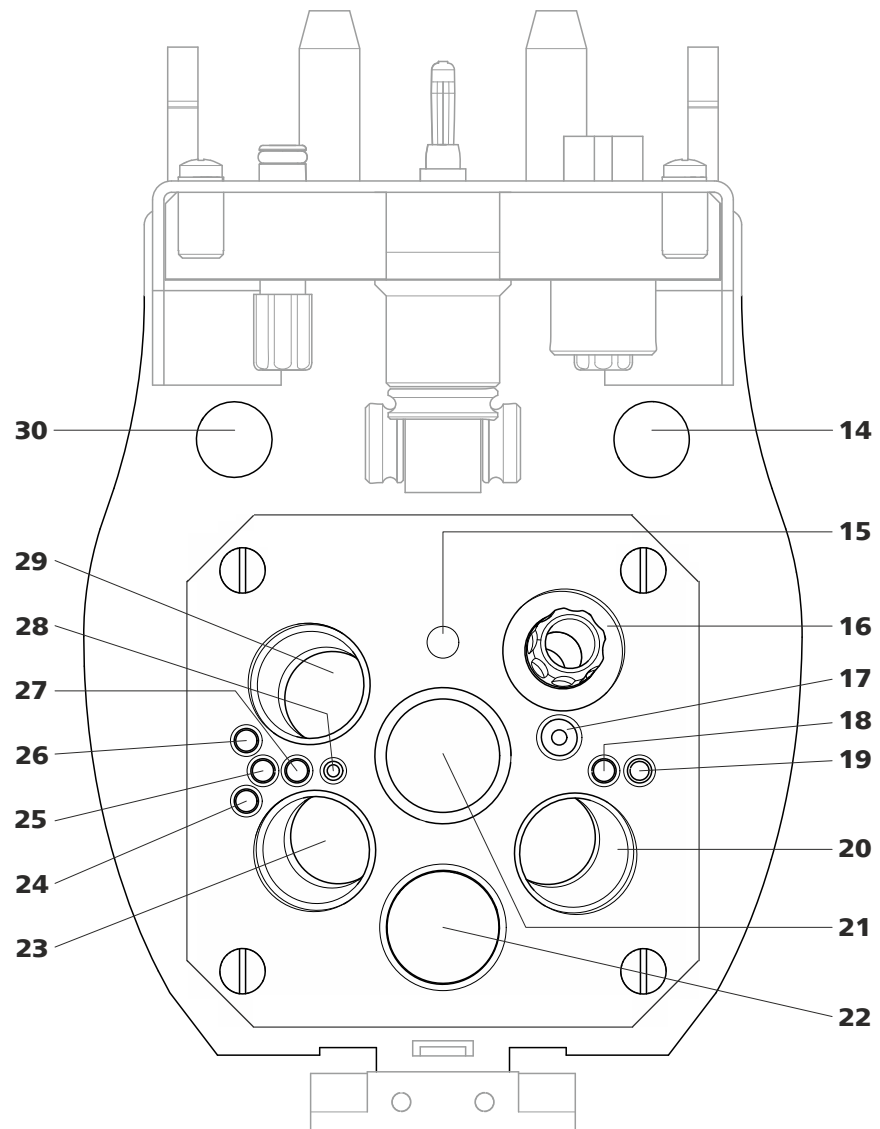


Figure 9 RDE measuring head insert

14 Opening

For feeding through a four-way micro dosing tip (6.1824.000) from below.

16 Threaded opening

With preinstalled screw nipple and stopper. Can be equipped with a four-way micro dosing tip (6.1824.000).

15 Opening

For positioning the driving axle.

17 M6 threaded opening

With preinstalled tubing connection to threaded opening **12** (TAP) - gas inlet via the measuring solution for keeping out oxygen during the measurement. *For voltammetric applications, not applicable to CVS analyses.*

**18 Opening**

With preinstalled tubing connection to threaded opening **11** (OUT) - gas outlet. *For voltammetric applications, not applicable to CVS analyses.*

20 Opening for electrode

For inserting the reference electrode (RE).

22 Pipetting opening

For manually dosing solutions. Is closed with a 6.2709.100 stopper (7-5).

24 Opening

For adding or aspirating solutions. Can be connected with threaded opening **1, 2, 3** or **WASTE** (FEP tubing from 6.1829.070).

26 Opening

For adding or aspirating solutions. Can be connected with threaded opening **1, 2, 3** or **WASTE** (FEP tubing from 6.1829.070).

28 Opening

For the automated sample addition. Must be connected to threaded opening **5** (SMP) (PEEK capillary 6.1831.020).

30 Opening

For feeding through the temperature sensor cable from above.

19 Opening

For tubing connection to threaded opening **8** (PURGE) - gas inlet in the measuring solution. *For voltammetric applications, not applicable to CVS analyses.*

21 Opening for electrode

For inserting the driving axle for the RDE (working electrode - WE).

23 Opening for electrode

For inserting the auxiliary electrode (AE).

25 Opening

For adding or aspirating solutions. Can be connected with threaded opening **1, 2, 3** or **WASTE** (FEP tubing from 6.1829.070).

27 Opening

For adding or aspirating solutions. Can be connected with threaded opening **1, 2, 3** or **WASTE** (FEP tubing from 6.1829.070).

29 Opening for sensor

For inserting a temperature sensor (Pt1000).

2.4.3 Tubing connector (measuring head arm)

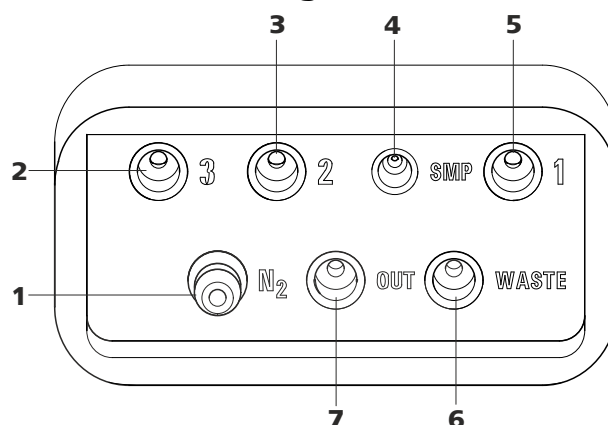


Figure 10 Tubing connector (measuring head arm)

1 Nipple (N₂)

Is connected to threaded openings **TAP**, **PURGE** and **N₂** via the measuring head arm. *For voltammetric applications, not applicable to CVS analyses.*

3 M6 threaded opening (2)

For connecting tubing for adding solutions.

5 M6 threaded opening (1)

For connecting tubing for adding solutions.

7 M6 threaded opening (OUT)

For pressure compensation in the measuring vessel.

2 M6 threaded opening (3)

For connecting tubing for adding solutions.

4 UNF 10/32 threaded opening (SMP)

For connecting a PEEK capillary for the automated sample addition.

6 M6 threaded opening (WASTE)

For connecting tubing for aspirating the measuring solution.



2.5 SPE measuring head

2.5.1 SPE measuring head overview

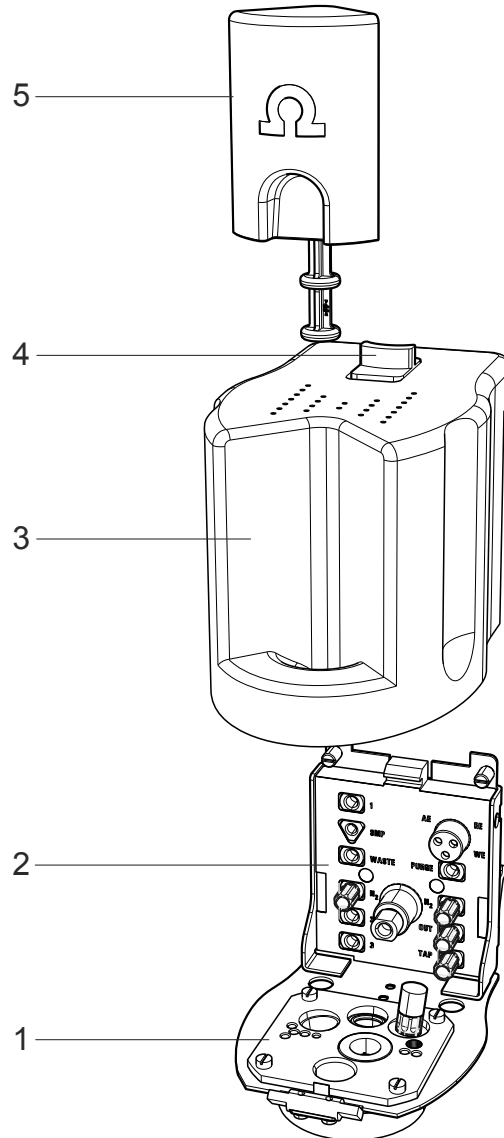


Figure 11 SPE measuring head - Overview

1 Measuring head insert

With openings for inserting electrodes and tubing connections (see figure 13, page 29).

2 Measuring head connector plate

For connecting the SPE measuring head to the connector plate of the measuring head arm (1-4).

For connecting the electrodes and tubing (see figure 12, page 27).

3 Measuring head cover
For shielding against electromagnetic interference.

4 Slide lock
For measuring head cover.

5 Stopper (6.2709.100)
For closing the pipetting opening (13-20).

2.5.2 SPE measuring head connector plate and measuring head insert

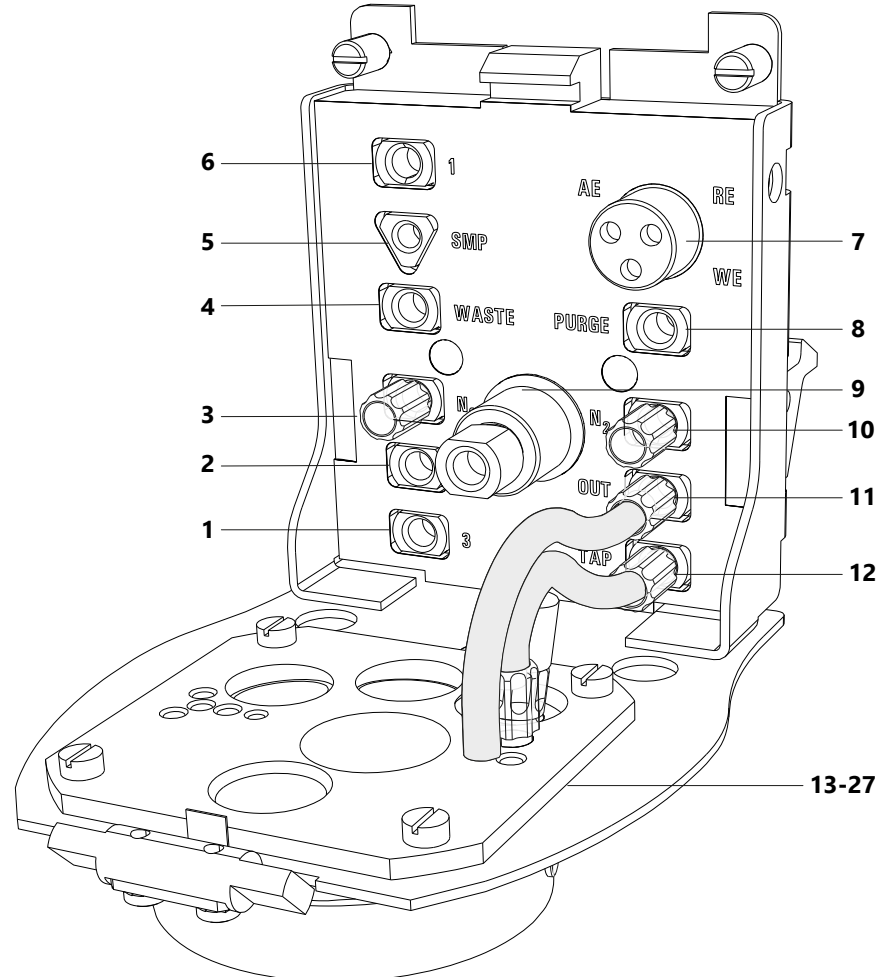


Figure 12 SPE measuring head connector plate

1 M6 threaded opening (3)
For adding solutions. Can be connected to one of the openings **21 - 24** (FEP tubing from 6.1829.070).

2 M6 threaded opening (2)
For adding solutions. Can be connected to one of the openings **21 - 24** (FEP tubing from 6.1829.070).

3 M6 threaded opening (N₂)
With preinstalled stopper. *Not applicable to SPE applications.*

4 M6 threaded opening (WASTE)
For aspirating the measuring solution. Can be connected to one of the openings **21 - 24** (FEP tubing from 6.1829.070).

**5 UNF 10/32 threaded opening (SMP)**

For the automated sample addition. Must be connected to opening **25** (PEEK capillary 6.1831.020).

7 Electrode connector (AE, RE, WE)

With electrode cables, for connecting electrodes.

9 Flexible drive shaft for the stirrer**11 M6 threaded opening (OUT)**

With preinstalled tubing connection to opening **17** - gas outlet.

13 - 27: see next figure

6 M6 threaded opening (1)

For adding solutions. Can be connected to one of the openings **21 - 24** (FEP tubing from 6.1829.070).

8 Threaded opening (PURGE)

For tubing connection to opening **18** - gas inlet in the measuring solution.

10 M6 threaded opening (N₂)

With preinstalled stopper. *Not applicable to SPE applications.*

12 M6 threaded opening (TAP)

With preinstalled tubing connection to threaded opening **16** - gas inlet via the measuring solution for keeping out oxygen during the measurement. *For voltammetric applications, not applicable to CVS analyses.*

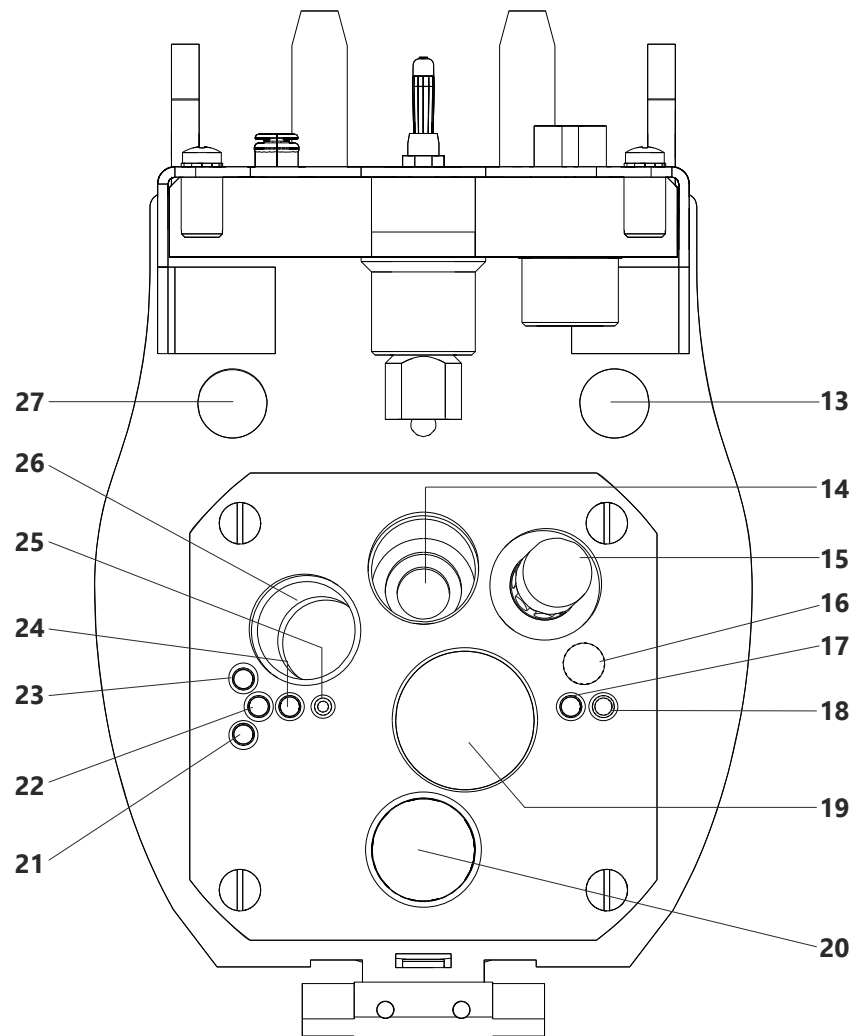


Figure 13 SPE measuring head insert

13 Opening

For feeding through a four-way micro dosing tip (6.1824.000) from below.

15 Threaded opening

With preinstalled screw nipple and stopper. Can be equipped with a four-way micro dosing tip (6.1824.000).

17 Opening

With preinstalled tubing connection to threaded opening **11** (OUT) - gas outlet.

14 Opening

For positioning the stirrer.

16 M6 threaded opening

With preinstalled tubing connection to threaded opening **12** (TAP) - gas inlet via the measuring solution for keeping out oxygen during the measurement.

18 Opening

For tubing connection to threaded opening **8** (PURGE) - gas inlet in the measuring solution.

**19 Opening for electrode**

For inserting the 6.1241.090 SPE electrode shaft with the screen-printed electrode (SPE).

Optional: 6.2709.130 adapter for use of the scTRACE Gold (6.1258.000) with the electrode shaft for the scTRACE Gold (6.1241.080) in the SPE measuring head.

21 Opening

For adding or aspirating solutions. Can be connected with threaded opening **1, 2, 3** or **WASTE** (FEP tubing from 6.1829.070).

23 Opening

For adding or aspirating solutions. Can be connected with threaded opening **1, 2, 3** or **WASTE** (FEP tubing from 6.1829.070).

25 Opening

For the automated sample addition. Must be connected to threaded opening **5** (SMP) (PEEK capillary 6.1831.020).

27 Opening

For feeding through the temperature sensor cable from above.

20 Pipetting opening

For manually dosing solutions. Is closed with a 6.2709.100 stopper (**11-5**).

22 Opening

For adding or aspirating solutions. Can be connected with threaded opening **1, 2, 3** or **WASTE** (FEP tubing from 6.1829.070).

24 Opening

For adding or aspirating solutions. Can be connected with threaded opening **1, 2, 3** or **WASTE** (FEP tubing from 6.1829.070).

26 Opening for sensor

For inserting a temperature sensor (Pt1000).

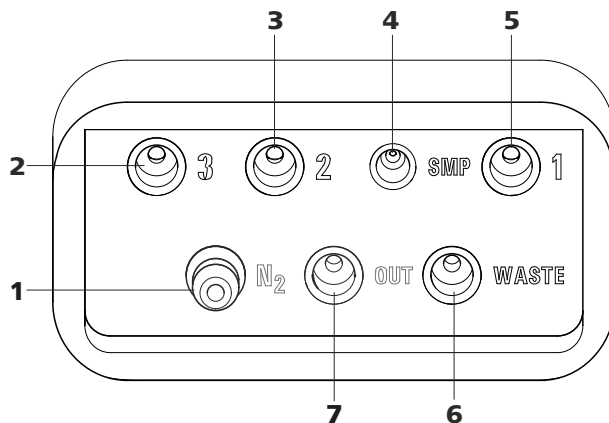
2.5.3 Tubing connector (measuring head arm)

Figure 14 Tubing connector (measuring head arm)

1 Nipple (N₂)

For connecting the inert gas supply. Is connected to threaded openings **TAP**, **PURGE** and **N₂** via the measuring head arm.

2 M6 threaded opening (3)

For connecting tubing for adding solutions.

.....

3 M6 threaded opening (2)
For connecting tubing for adding solutions.

5 M6 threaded opening (1)
For connecting tubing for adding solutions.

7 M6 threaded opening (OUT)
For pressure compensation in the measuring vessel.

4 UNF 10/32 threaded opening (SMP)
For connecting a capillary for automated sample addition.

6 M6 threaded opening (WASTE)
For connecting tubing for aspirating the measuring solution.

3 Installation

3.1 Setting up the instrument

3.1.1 Packaging

The instrument is supplied in protective packaging together with the separately packed accessories. Keep this packaging, as only this ensures safe transportation of the instrument.

3.1.2 Checks

Immediately after receipt, check whether the shipment has arrived complete and without damage by comparing it with the delivery note.

3.1.3 Location

The instrument has been developed for operation indoors and may not be used in explosive environments.

Place the instrument in a location of the laboratory which is suitable for operation and free of vibrations and which provides protection against corrosive atmosphere and contamination by chemicals.

The instrument should be protected against excessive temperature fluctuations and direct sunlight. Do not place the instrument in the vicinity of an air-conditioning unit outlet.

3.2 Equipping the MME measuring head



CAUTION

The measuring head insert (*see figure 5, page 17*) is made of PTFE. Do not use sharp objects around it to ensure the material is not damaged.

3.2.1 Preparing the MME measuring head



NOTICE

For equipping, Metrohm recommends placing the MME measuring head in the measuring head holder and only then inserting it onto the measuring head arm.

- 1 Remove the stopper (3-5) from the pipetting opening to remove the measuring head cover.

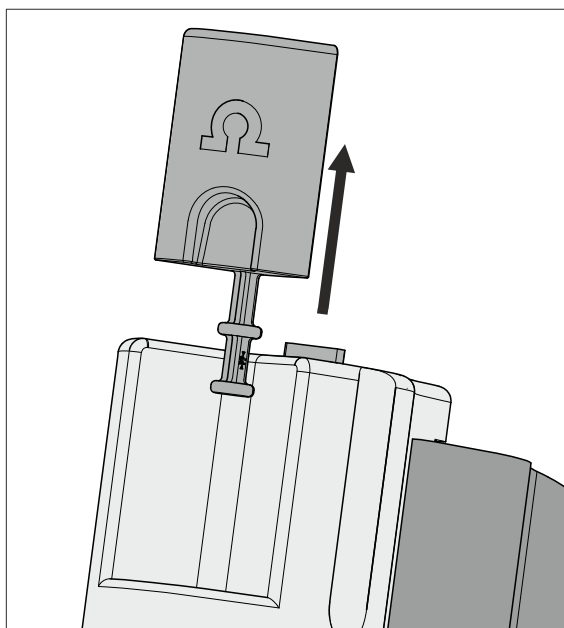


Figure 15 Removing the stopper from the pipetting opening

- 2 Pull the slide lock (3-4) on the top of the measuring head cover towards you and, at the same time, tilt the measuring head cover to an angle of approx. 45° and remove it.

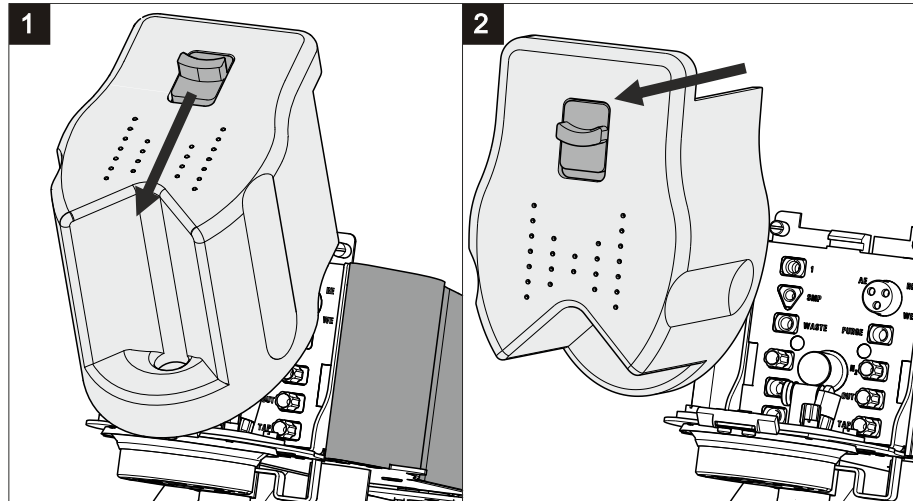


Figure 16 Removing the measuring head cover

3 Connecting the gas inlet

- Insert the PTFE tubing for adding gas to the solution (6.1829.030) through the opening (5-**19**).
- Pull the transparent inner tubing through as far as it will go.
- Ensure that the green kink protection is protecting the entire piece of tubing.

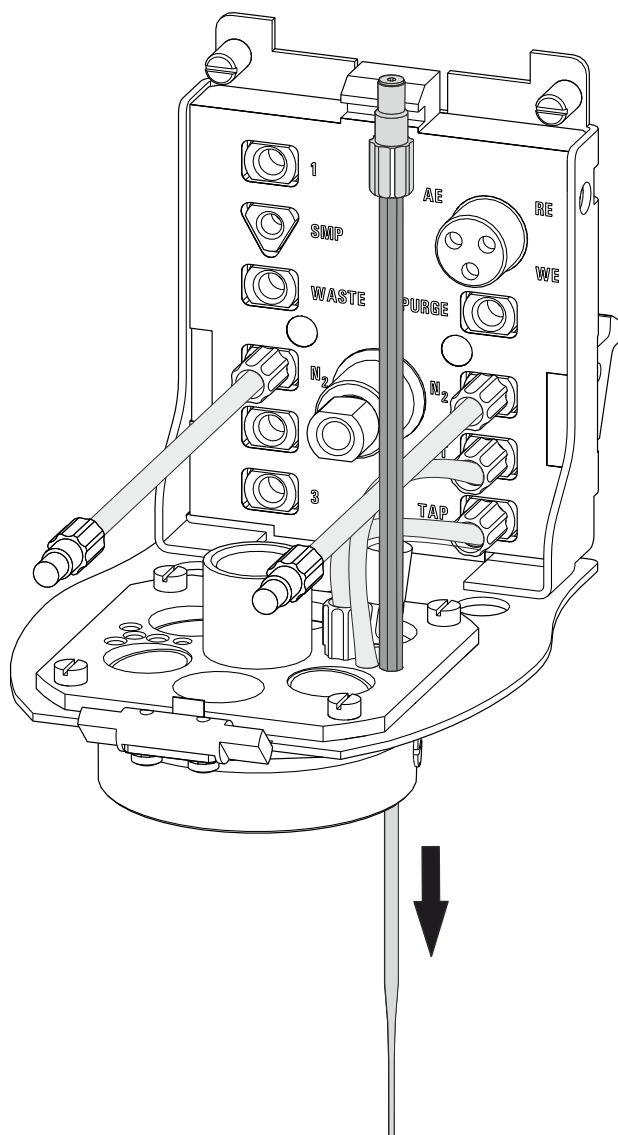


Figure 17 Inserting the gas inlet

- Connect the tubing to the PURGE threaded opening (4-8) and tighten it hand-tight.
- Finally, tighten the tubing nipple using the wrench provided (6.2739.000).

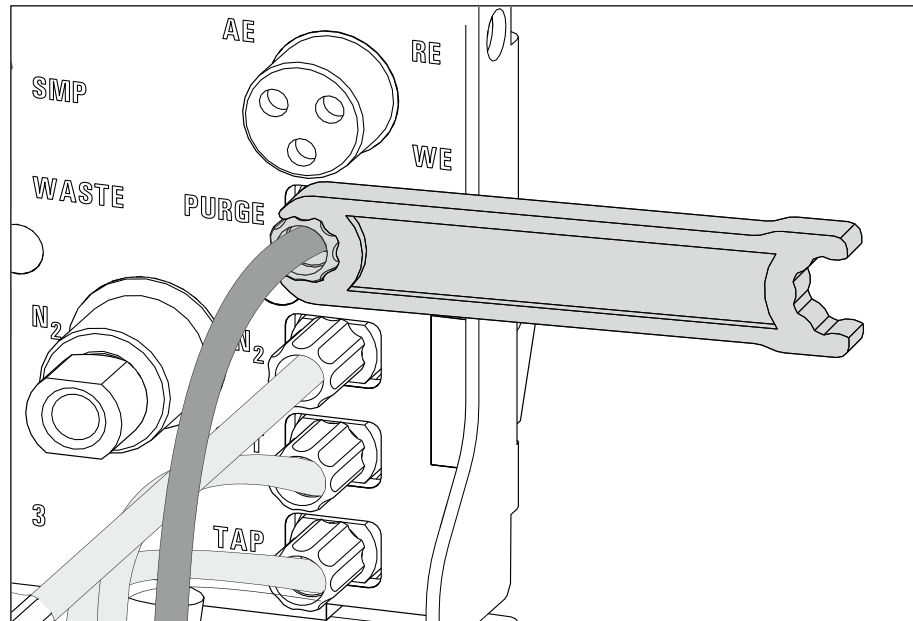


Figure 18 Connecting the gas inlet

4 Inserting the stirrer

- Screw one end of the flexible shaft to the stirrer using the clamping screw. While fastening the flexible shaft, push it through as far as it will go.
- Tighten the flexible shaft. To do so, screw the clamping screw for the flexible shaft into the stirrer using 2 wrenches (6.2739.000). In the process, ensure that the flexible shaft is not kinked.

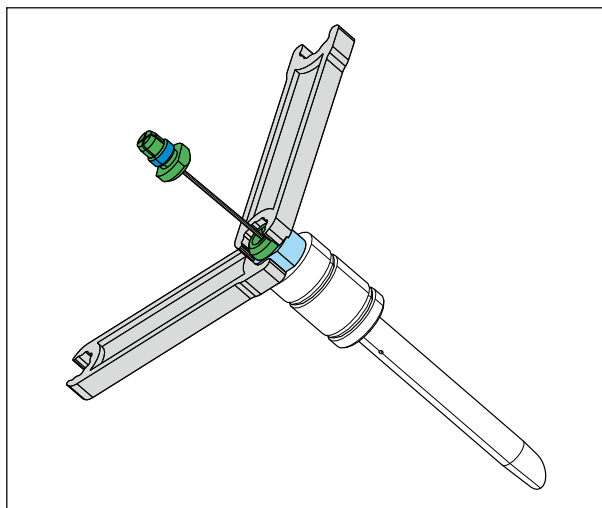


Figure 19 Screwing in the flexible shaft

- Insert the stirrer into the opening (5-15) and press it down as far as it will go.

- Fasten the other end of the flexible shaft to the drive shaft (4-9) using the second clamping screw. While doing so, push the flexible shaft through far enough so that the course is as straight as possible.
- Screw the clamping screw for the flexible shaft to the drive shaft using 2 wrenches (6.2739.000). In the process, ensure that the flexible shaft is not kinked.

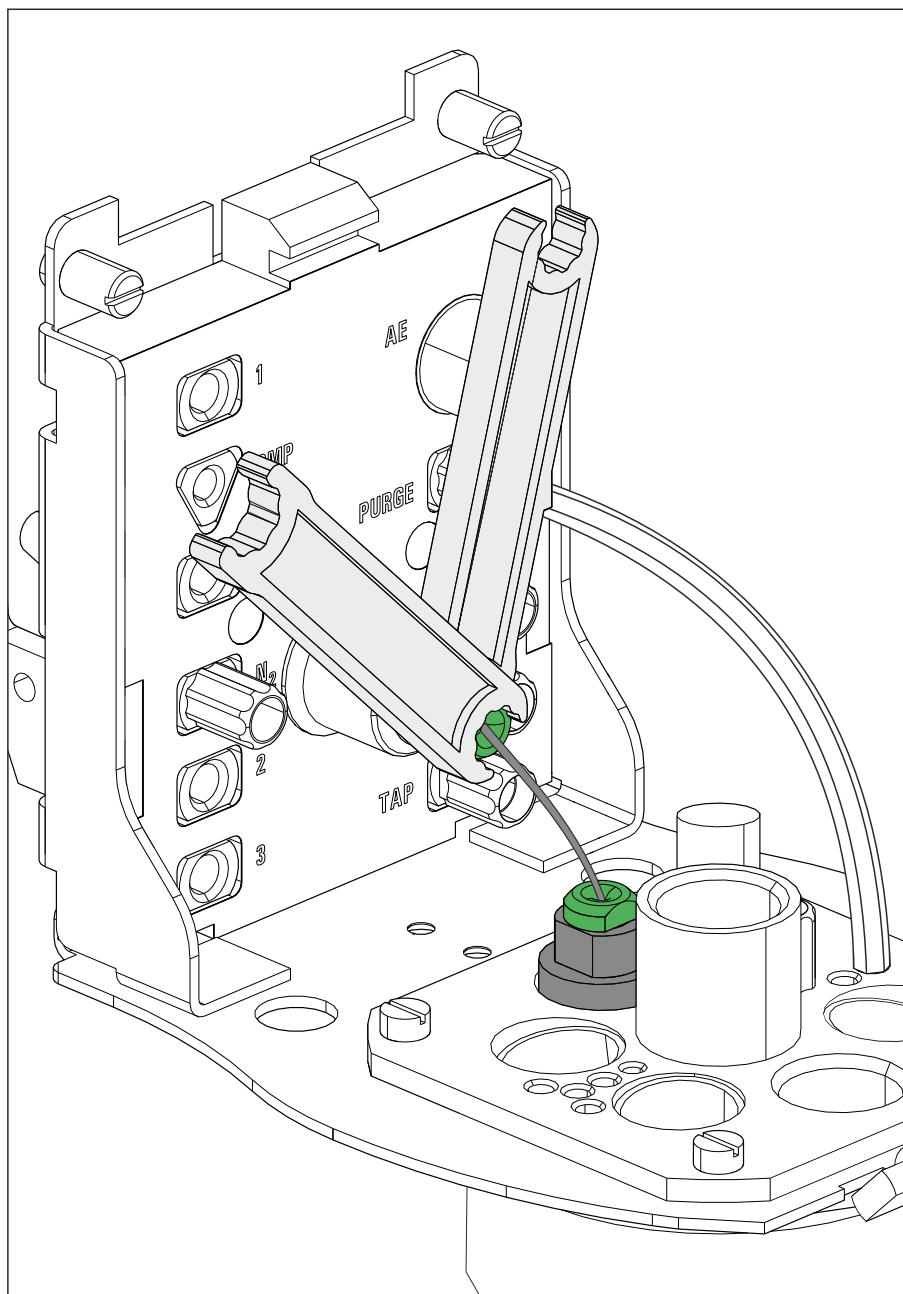


Figure 20 Inserting and connecting the stirrer

5 Inserting the stopper

- If the openings (5-24)-(5-29) are not needed (for manual operation), seal them with the stoppers provided (6.2709.110).



NOTICE

The stopper shown in light blue in the figure has a smaller diameter than the others. Keep this in mind when inserting the stopper.

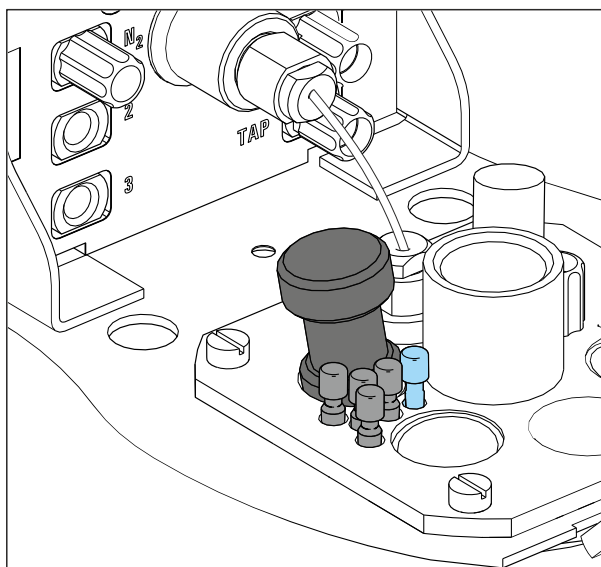


Figure 21 Inserting the stopper

3.2.2 Preparing electrodes and inserting them in the MME measuring head

The 884 Professional VA uses the 3-electrode principle. The following electrodes are used:

- Multi-Mode Electrode pro (MME pro) as the working electrode (WE)
- Reference electrode (RE)
- Auxiliary electrode (AE)

**NOTICE**

Also observe the notes contained in the electrode leaflets that can be downloaded from the [Metrohm website](#) using the corresponding article number. In addition, you can learn how to best handle the electrodes from the multimedia guide (A.717.0003).

For detailed information about handling the Multi-Mode Electrode pro (MME pro), observe the *Multi-Mode Electrode pro* document (8.110.8018XX).

3.2.2.1 Working electrode (WE)**Preparing and inserting the working electrode**

Proceed as follows:

1 Preparing the working electrode

Prepare the working electrode in accordance with the instructions in the *Multi-Mode Electrode pro* document (8.110.8018XX). In preparation, carry out the following tasks:

- Mount the capillary
- Insert the needle
- Top up the mercury

2 Inserting the working electrode into the measuring head insert

- Place an empty measuring vessel in the holder (**1-3**).
- Carefully insert the working electrode into the opening (**5-21**) of the measuring head insert. The bottom of the capillary must not touch the measuring head while being inserted.

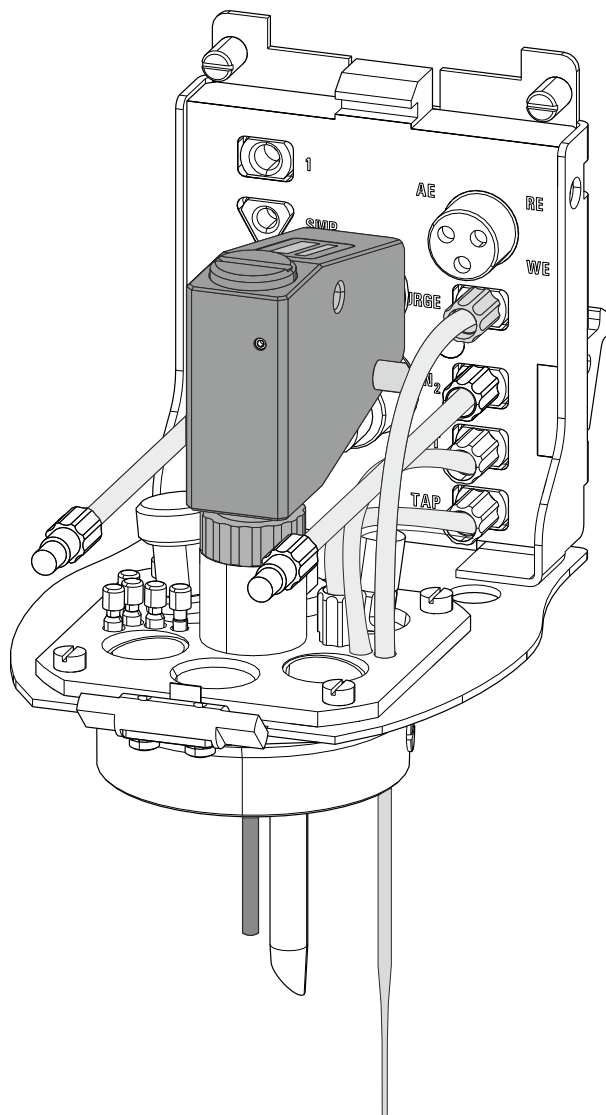


Figure 22 Inserting the working electrode

3 Connecting the working electrode



CAUTION

The electrode cables for the reference, working and auxiliary electrode look identical. Observe the markings on the plugs, because the 3 cables must not be mixed up.

Plug the electrode cable (4-7) with the **WE** marking on the plug onto the metal contact of the working electrode.

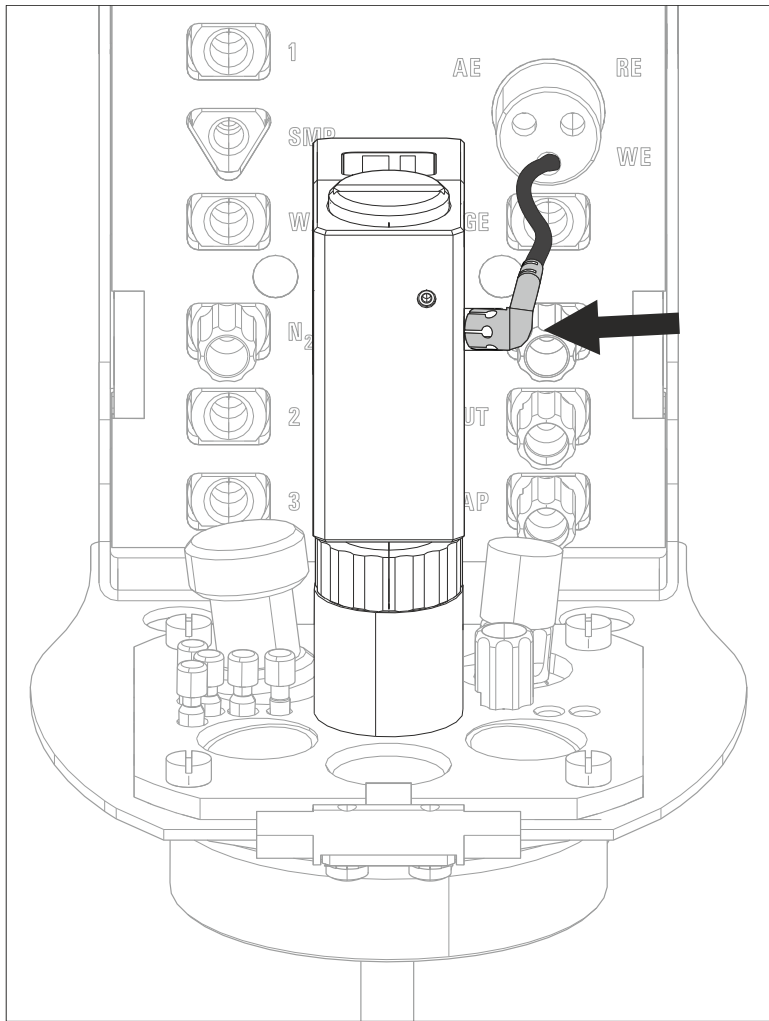


Figure 23 Connecting the working electrode



4 Connecting the inert gas inlet

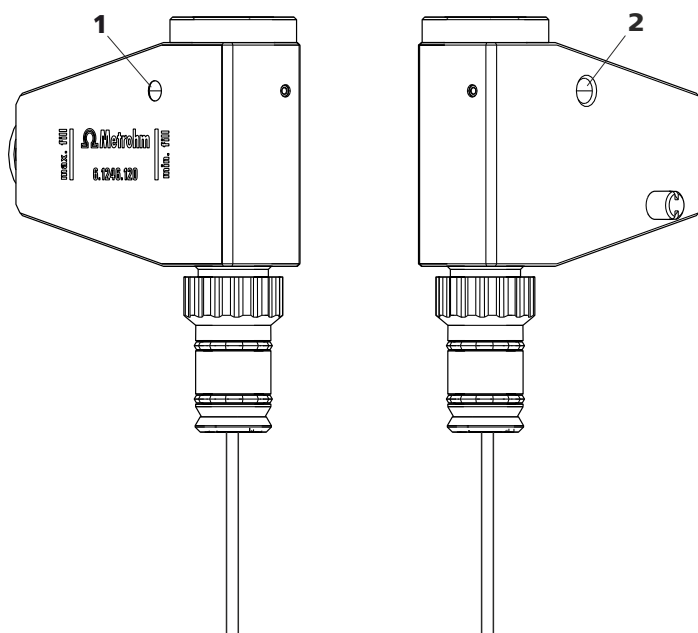


Figure 24 Connecting the inert gas inlet

1 Inert gas connection, left

2 Inert gas connection, right

- Screw in the FEP tubing to the inert gas inlet (N₂, (4-**3**)) in the connection (24-**1**) for the MME pro.
- Screw in the FEP tubing to the inert gas inlet (N₂, (4-**10**)) in the connection (24-**2**) for the MME pro.



NOTICE

Observe (see chapter 3.2.4, page 51) for information on connecting the inert gas supply.

5 Adjusting the needle valve

Adjust the needle valve in accordance with the instructions in the *Multi-Mode Electrode pro* document (8.110.8018XX) and the *Electrodes in Voltammetry* multimedia guide (A.717.0003).

6 Testing the electrode function

Test the electrode function in accordance with the instructions in the *Multi-Mode Electrode pro* document (8.110.8018XX).

3.2.2.2 Reference electrode (RE)

The reference electrode consists of the following 2 articles:

- Reference electrode filled with reference electrolyte (e.g. 6.0728.120)
- Electrolyte vessel filled with bridge electrolyte (e.g. 6.1245.010)

Preparing and inserting the reference electrode

Proceed as follows:

- 1** Remove the reference electrode from the storage vessel.

The reference electrode that is part of the accessories is already filled with reference electrolyte ($c(\text{KCl}) = 3 \text{ mol/L}$).

- 2** Fill the electrolyte vessel with bridge electrolyte (e.g. $c(\text{KCl}) = 3 \text{ mol/L}$) in accordance with the information in the electrode leaflet.

- 3** Allow the bridge electrolyte to react in the electrolyte vessel until the diaphragm is soaked with bridge electrolyte.

- 4** Place the reference electrode in the filled electrolyte vessel and screw it in place.

The electrolyte solution that is displaced in the electrolyte vessel is forced out of the deaeration openings.

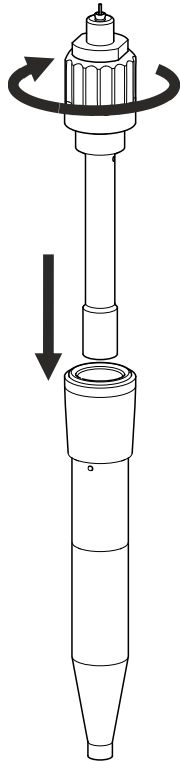


Figure 25 Assembling the reference electrode with the electrolyte vessel

- 5 Rinse the installed reference electrode with ultrapure water.
- 6 Insert the installed reference electrode into the opening (5-20) of the measuring head insert.

7



CAUTION

The electrode cables for the reference, working and auxiliary electrode look identical. Observe the markings on the plugs, because the 3 cables must not be mixed up.

Plug the electrode cable (4-7) with the **RE** marking on the plug onto the metal contact of the reference electrode.

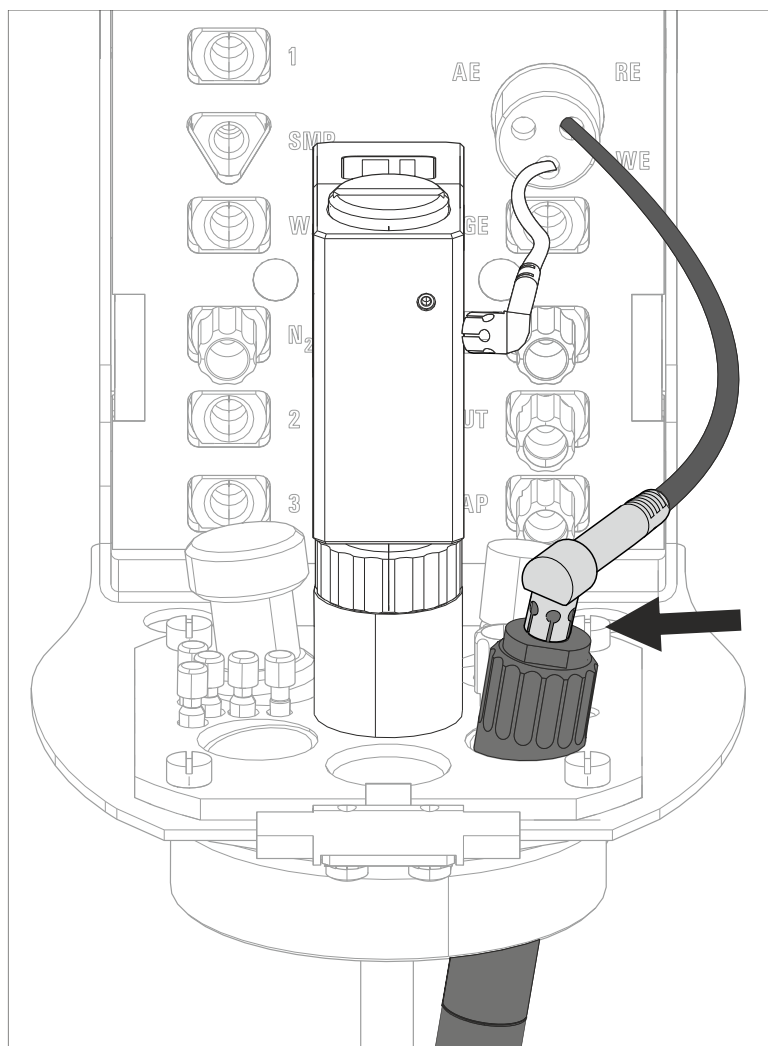


Figure 26 Connecting a reference electrode

3.2.2.3 Auxiliary electrode (AE)

The following electrodes can be used as auxiliary electrodes (AE):

- **Pt auxiliary electrode (6.0343.100)**: Included in standard delivery
- **Electrode holder (6.1241.120)** and **glassy carbon rod (6.1247.000)**: Together form the optionally available glassy carbon auxiliary electrode

The Pt auxiliary electrode (6.0343.000) included in standard delivery can be inserted directly into the measuring head. The optionally available GC auxiliary electrode has to be put together first.

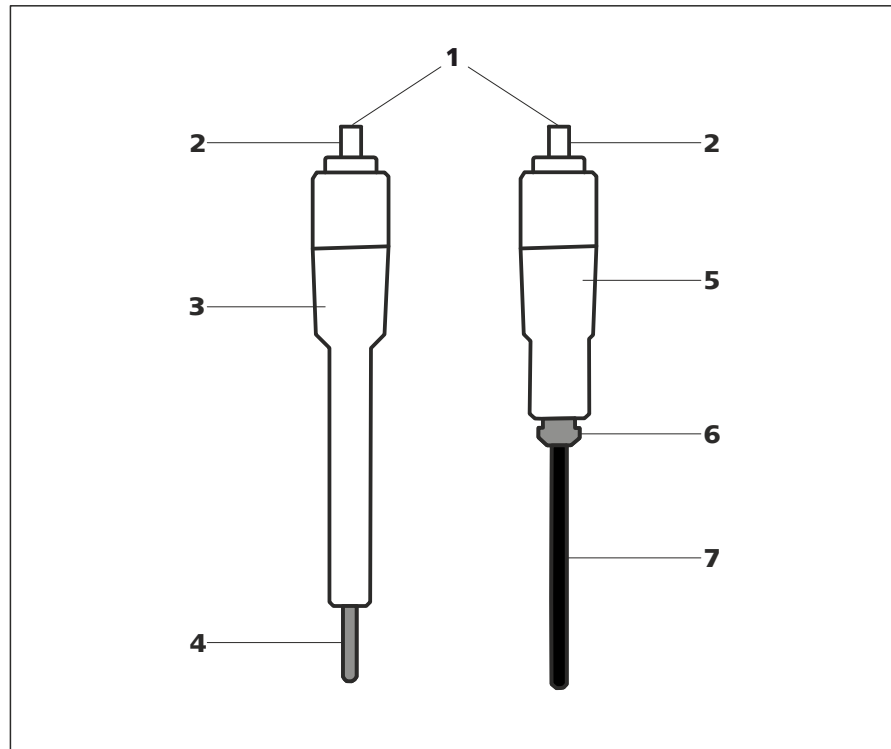


Figure 27 Structure of the auxiliary electrodes

1	Auxiliary electrode	2	Electrical connection for the "AE" cable
3	Pt auxiliary electrode (6.0343.100)	4	Pt rod (permanently mounted)
5	Electrode holder (6.1241.120)	6	Retaining ring
7	Glassy carbon rod (6.1247.000)		

Assembling the GC auxiliary electrode

Proceed as follows to assemble the optionally available GC auxiliary electrode:

1



CAUTION

Glassy carbon is a brittle, very fragile material; proceed with caution when inserting it into the electrode holder and handling it.

In the event the GC rod breaks, the remaining part in the holder can be removed by pulling out the retaining ring (27-6).

Insert the glassy carbon rod (27-7) through the retaining ring (27-6) into the electrode holder (27-5) as far as it will go.

Inserting the auxiliary electrode (Pt auxiliary electrode or GC auxiliary electrode)

Proceed as follows to insert the auxiliary electrode into the measuring head:

- 1 Insert the auxiliary electrode into the opening (5-23) of the measuring head insert.

2



CAUTION

The electrode cables for the reference, working and auxiliary electrode look identical. Observe the markings on the plugs, because the 3 cables must not be mixed up.

Plug the electrode cable (4-7) with the **AE** marking on the plug onto the metal contact of the auxiliary electrode.

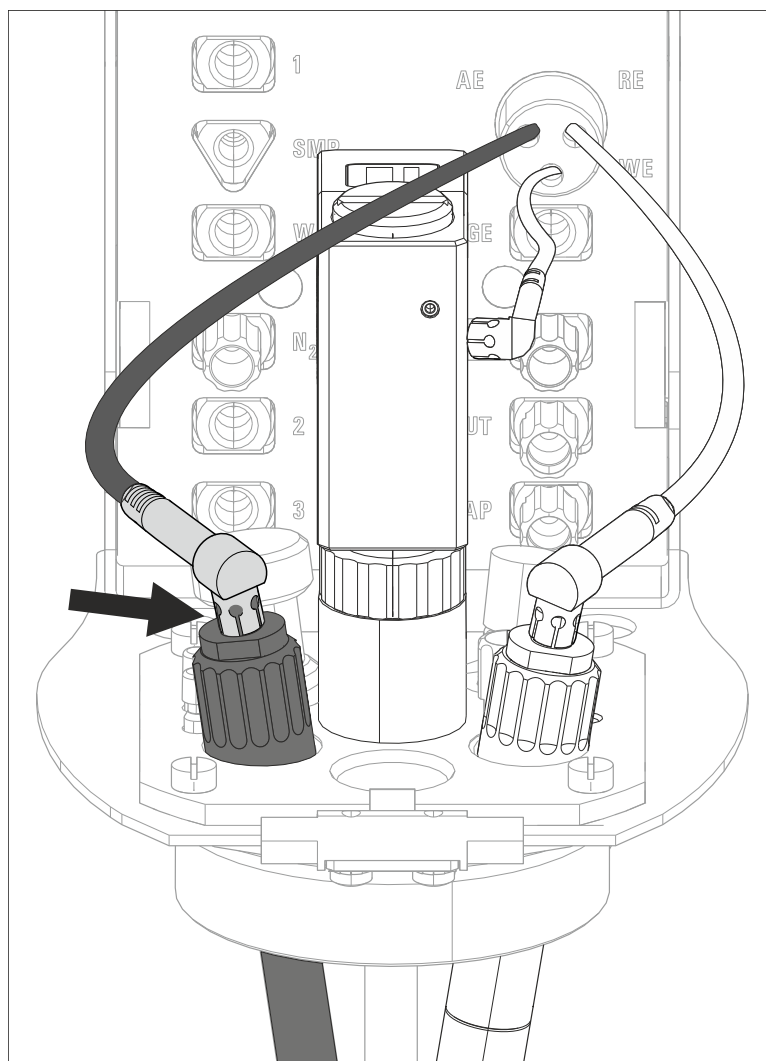


Figure 28 Connecting the auxiliary electrode

3.2.3 Inserting the MME measuring head

Once the MME measuring head has been fully equipped, it can be inserted on the measuring head arm. Proceed as follows:

1 Installing the measuring head cover

Place the measuring head cover at an angle of approx. 45° in the guide bolt in the front part of the measuring head insert.

Fold back the measuring head cover and gently push it in place.

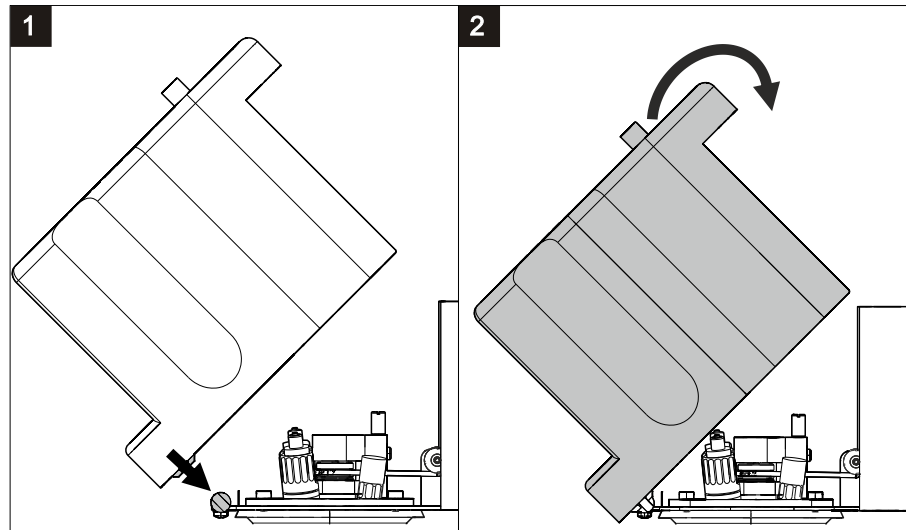


Figure 29 Installing the measuring head cover

The measuring head cover must snap into place with an audible click.

2 Inserting the stopper

Insert the stopper (3-5) into the pipetting opening.

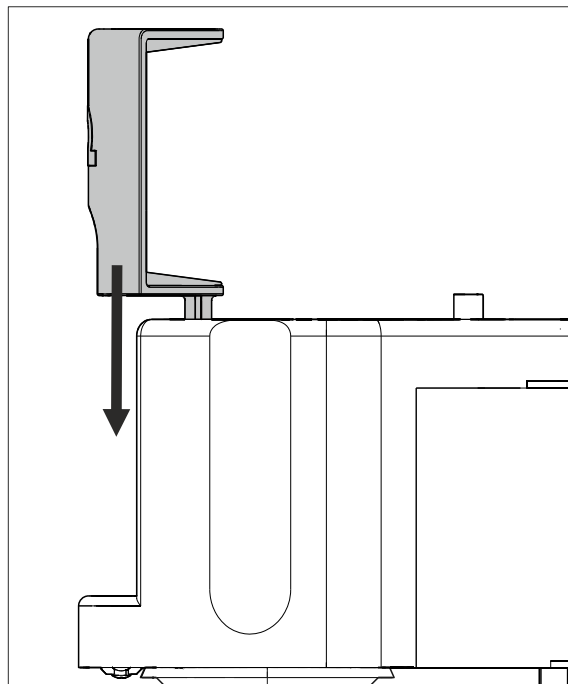


Figure 30 Inserting the stopper in the pipetting opening



3 Inserting the measuring head



WARNING

If the measuring head arm is folded down without due care, this may result in injuries to the hands.

Make sure that your fingers do not get caught between the measuring head arm and the instrument housing.



CAUTION

Do not apply pressure to the drive disk on the connector plate of the measuring head arm. Otherwise, the stirrer motor may be damaged.

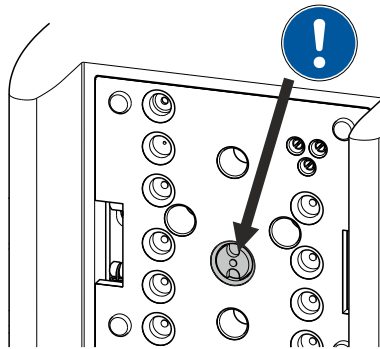


Figure 31 Do not touch the drive disk

Use one hand to hold the measuring head arm on the rear and use the other hand to insert the measuring head into the connector plate of the measuring head arm.

The measuring head must snap into place with an audible click.

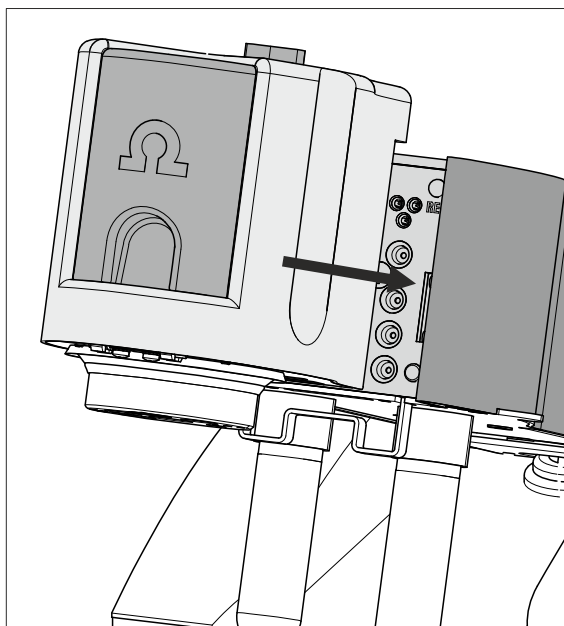


Figure 32 Inserting the measuring head

3.2.4 Connecting the inert gas supply

Generally, nitrogen (N_2) is used as inert gas in VA trace analysis for purging the measuring solution and for operating the MME pro, the SPE and the RDE. Only nitrogen of sufficient purity may be used for this.

For general polarography/voltammetry:

- 4.5 ($w(N_2) = 99.995\%$)

For analyses in organic solvents; for determinations that result in very high current strengths (such as for determining the smallest concentrations without preceding deposition)

- 5.0 ($w(N_2) = 99.999\%$)

1 Filling the gas washing glass

- Unscrew the gas washing glass (1-6) from the measuring head arm.
- Fill the gas washing glass as follows:
 - Standard: Fill the gas washing glass halfway with distilled H_2O .
 - For long-term measurement with base electrolytes like acetic acid/acetate buffer solution or ammonia/ammonium chloride buffer solution, add the base electrolyte.
 - For measurements in organic solvents, fill with the solvent being used.
- Screw the gas washing glass back onto the measuring head arm.

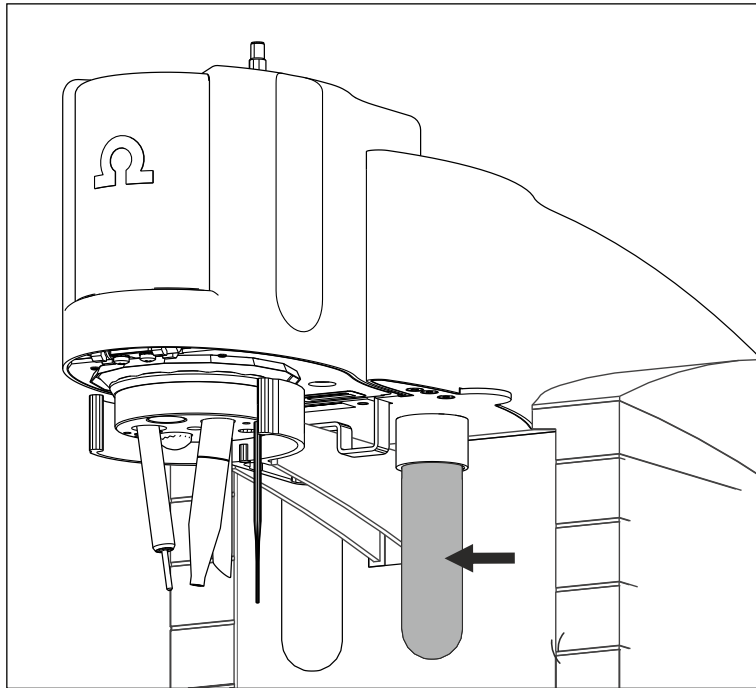


Figure 33 Gas washing glass

2 Connecting the inert gas inlet

- Connect one end of the PVC tubing (6.1801.080) on the **N₂** nipple of the 884 Professional VA.
- Connect the other end of the PVC tubing (6.1801.080) to the inert gas bottle connection.
- Set the inert gas pressure on the gas bottle to $p = 1.0$ to 1.2 bar (or 14.5 to 17.4 psi or 0.1 to 0.12 MPa) using the reducing valve.
- Open the gas inlet on the gas bottle.

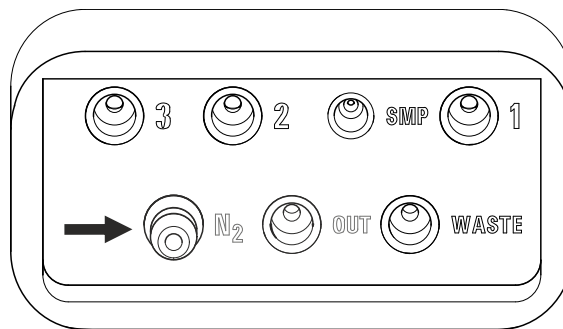


Figure 34 Nipple for inert gas supply

3.3 Equipping the RDE measuring head

The RDE measuring head can be used for both VA trace analysis and CVS analysis. If the measuring head is used for the determination of organic additives with CVS, then chapter 3.3.1, step 3 and chapter 3.3.4 can be omitted.



CAUTION

The measuring head insert (7-1) is made of PTFE. Do not use sharp objects around it to ensure the material is not damaged.

3.3.1 Preparing the RDE measuring head



NOTICE

For equipping, Metrohm recommends placing the RDE measuring head in the measuring head holder and only then inserting it onto the measuring head arm.

- 1 Remove the stopper (7-5) from the pipetting opening to remove the measuring head cover.

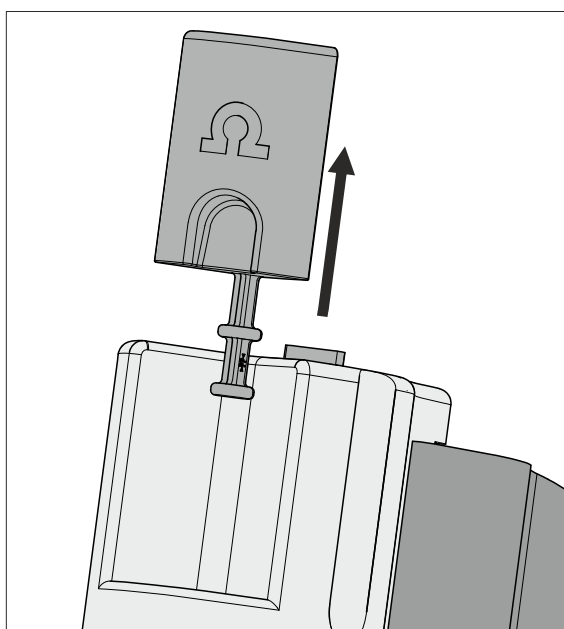


Figure 35 Removing the stopper from the pipetting opening



- 2 Pull the slide lock (7-4) on the top of the measuring head cover towards you and, at the same time, tilt the measuring head cover to an angle of approx. 45° and remove it.

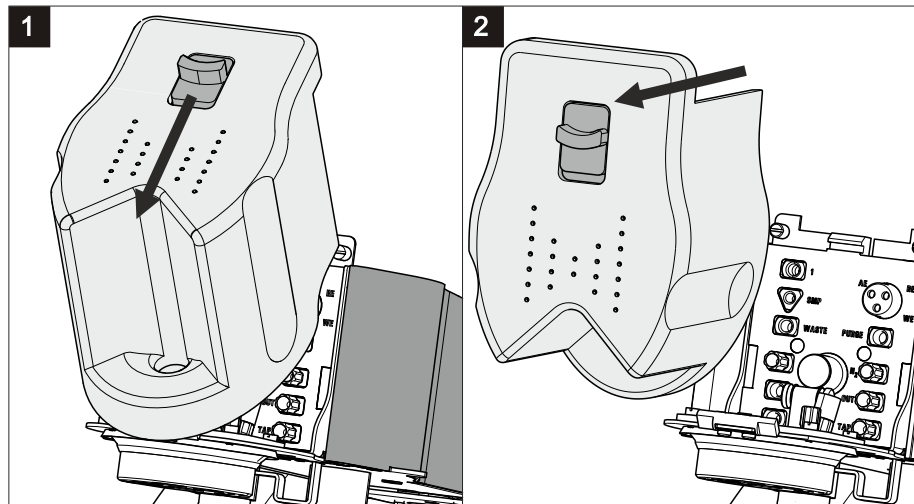


Figure 36 Removing the measuring head cover

3 Connecting the gas inlet



NOTICE

Only carry out this step if the RDE measuring head is used for VA trace analysis. If the RDE measuring head is used for CVS analysis, then no gas inlet is necessary.

- Insert the PTFE tubing for adding gas to the solution (6.1829.030) through the opening .
- Pull the transparent inner tubing through as far as it will go.
- Ensure that the green kink protection is protecting the entire piece of tubing.

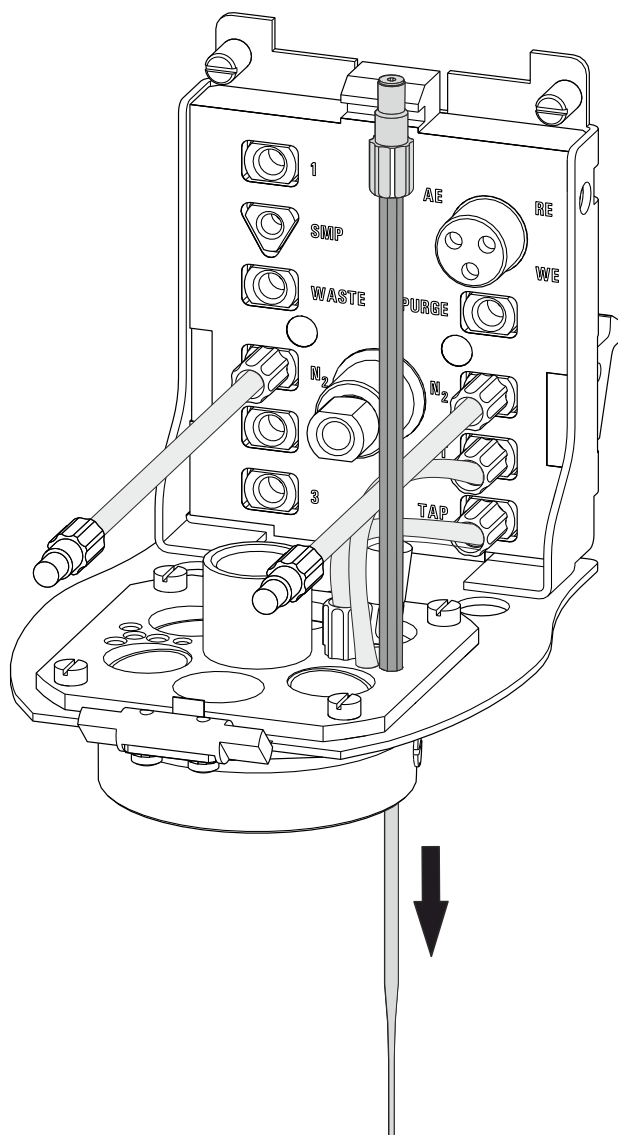


Figure 37 Inserting the gas inlet

- Connect the tubing to the PURGE threaded opening (4-8) and tighten it hand-tight.
- Finally, tighten the tubing nipple using the wrench provided (6.2739.000).

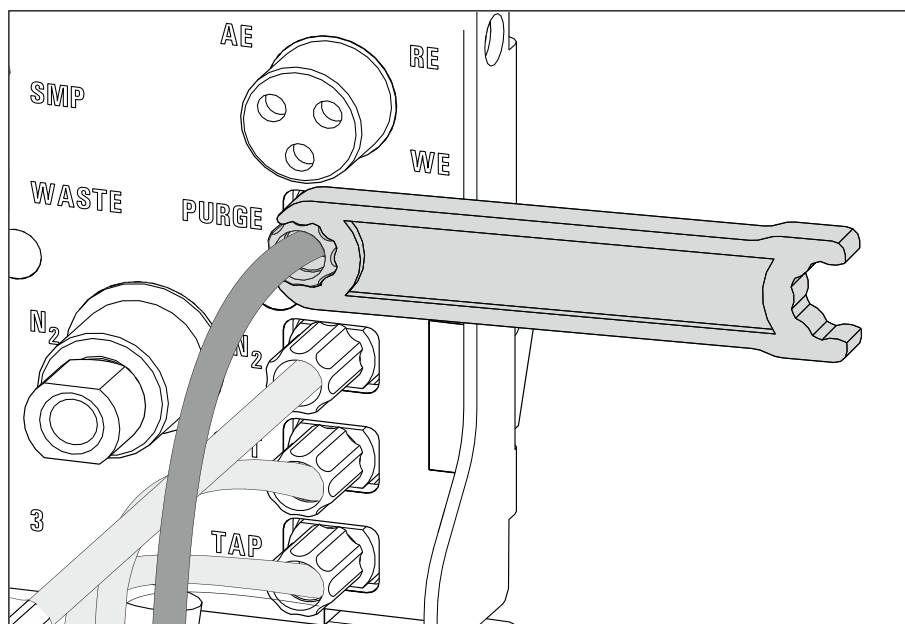


Figure 38 Connecting the gas inlet

3.3.2 Preparing electrodes and inserting them in the RDE measuring head

The 884 Professional VA uses the potentiostatic three-electrode principle. The following electrodes are used:

- Rotating disk electrode (RDE) as working electrode (WE)
- Reference electrode (RE)
- Auxiliary electrode (AE)



NOTICE

Also observe the notes contained in the electrode leaflets that can be downloaded from the [Metrohm website](#) using the corresponding article number. In addition, you can learn how to best handle the electrodes from the multimedia guide (A.717.0003).

3.3.2.1 Working electrode (WE)

The working electrode consists of the following 2 articles:

- Electrode tip (e.g. 6.1204.610)
- Driving axle for rotating disk electrode (RDE) (e.g. 6.1204.510)

Preparing and inserting the working electrode

Proceed as follows:

1 Preparing the electrode tip

Remove the protective cap from the electrode tip.

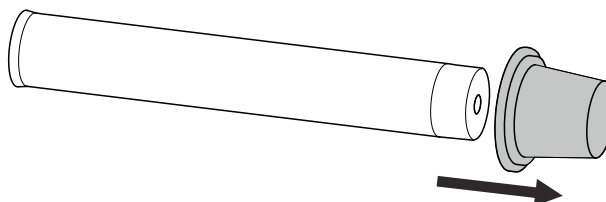


Figure 39 Removing the protective cap from the electrode tip

2 Assembling the working electrode

Hold the driving wheel by the driving axle and tighten the electrode tip to the driving axle.

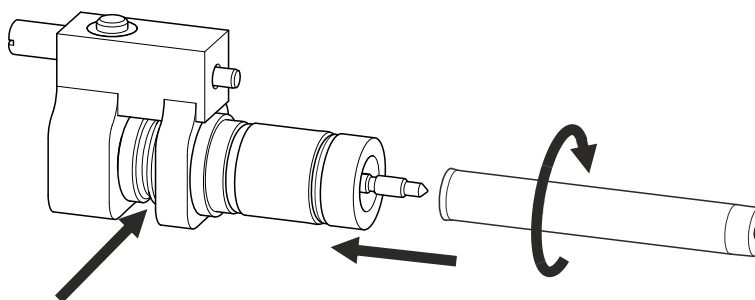


Figure 40 Tightening the electrode tip to the driving axle

3 Inserting the working electrode into the measuring head insert

Insert the working electrode into the opening (9-21) of the measuring head insert.

Make sure that the pin on the lower part of the driving axle is positioned in the opening (9-15) of the measuring head insert.

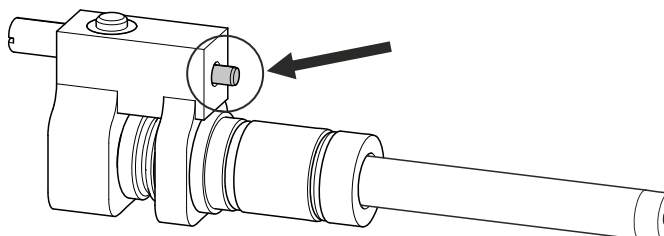


Figure 41 Working electrode, installed



4 Fastening the drive belt

- Slide the drive belt (6.1244.050) over the drive shaft (8-9),
- guide it on both sides over the guide roller (8-13) from below,
- pull it over the working electrode and fasten it in the driving wheel of the driving axle.

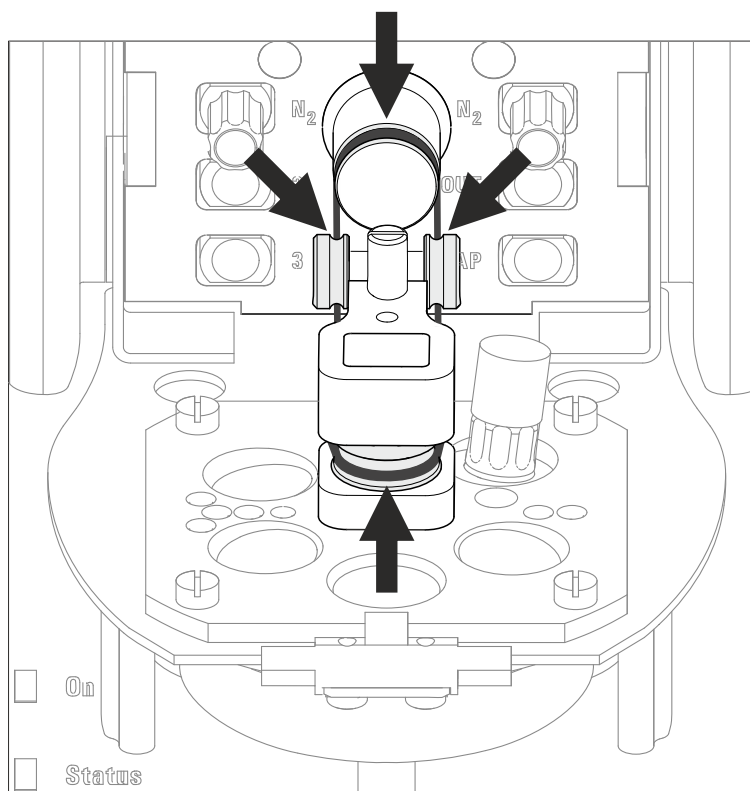


Figure 42 Fastening the drive belt



NOTICE

Make sure that the drive belt does not rub against the driving axle or surrounding components (tubing, cables, etc.).

5 Connecting the working electrode



CAUTION

The electrode cables for the reference, working and auxiliary electrode look identical. Observe the markings on the plugs, because the 3 cables must not be mixed up.

Plug the electrode cable (8-7) with the **WE** marking on the plug onto the metal contact of the driving axle.

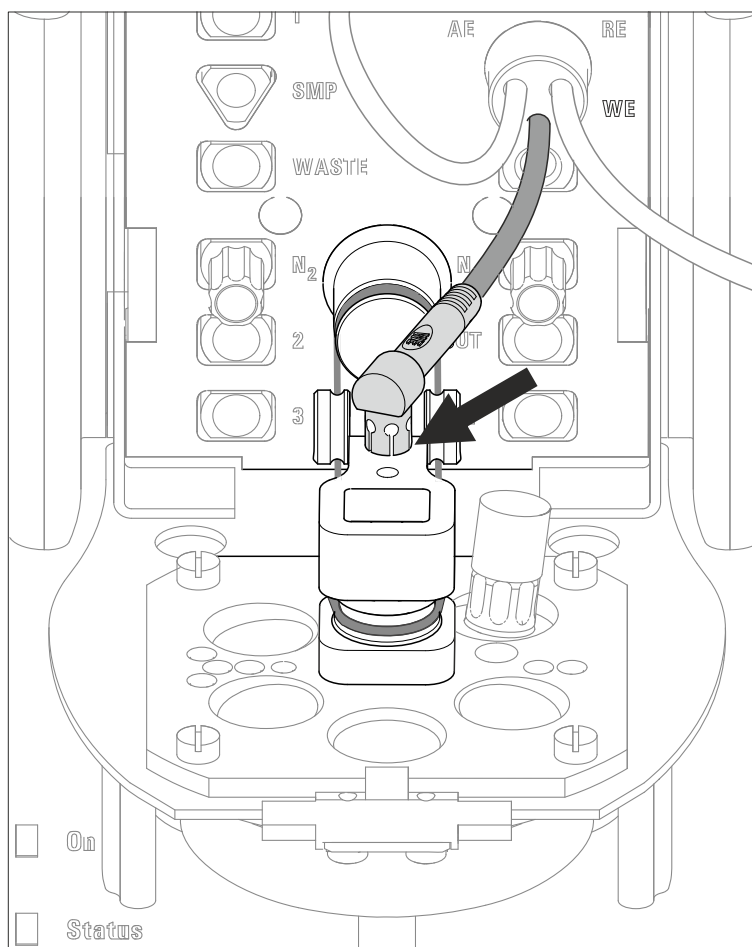


Figure 43 Connecting the working electrode

3.3.2.2 Reference electrode (RE)

The reference electrode consists of the following 2 articles:

- Reference electrode filled with reference electrolyte (e.g. 6.0728.130)
- Electrolyte vessel filled with bridge electrolyte (e.g. 6.1245.010)

Preparing and inserting the reference electrode

Proceed as follows:

- 1 Remove the reference electrode from the storage vessel.

The reference electrode that is part of the accessories is already filled with reference electrolyte ($c(\text{KCl}) = 3 \text{ mol/L}$).



- 2** Fill the electrolyte vessel with bridge electrolyte (e.g. $c(\text{KNO}_3) = 1$ mol/L) in accordance with the information in the electrode leaflet.
- 3** Allow the bridge electrolyte to react in the electrolyte vessel until the diaphragm is soaked with bridge electrolyte.
- 4** Place the reference electrode in the filled electrolyte vessel and screw it in place.

The electrolyte solution that is displaced in the electrolyte vessel is forced out of the deaeration openings.

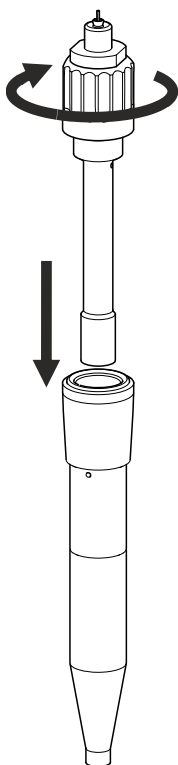


Figure 44 *Assembling the reference electrode with the electrolyte vessel*

- 5** Rinse the installed reference electrode with ultrapure water.
- 6** Insert the installed reference electrode into the opening (9-**20**) of the measuring head insert.

7

**CAUTION**

The electrode cables for the reference, working and auxiliary electrode look identical. Observe the markings on the plugs, because the 3 cables must not be mixed up.

Plug the electrode cable (8-7) with the **RE** marking on the plug onto the metal contact of the reference electrode.

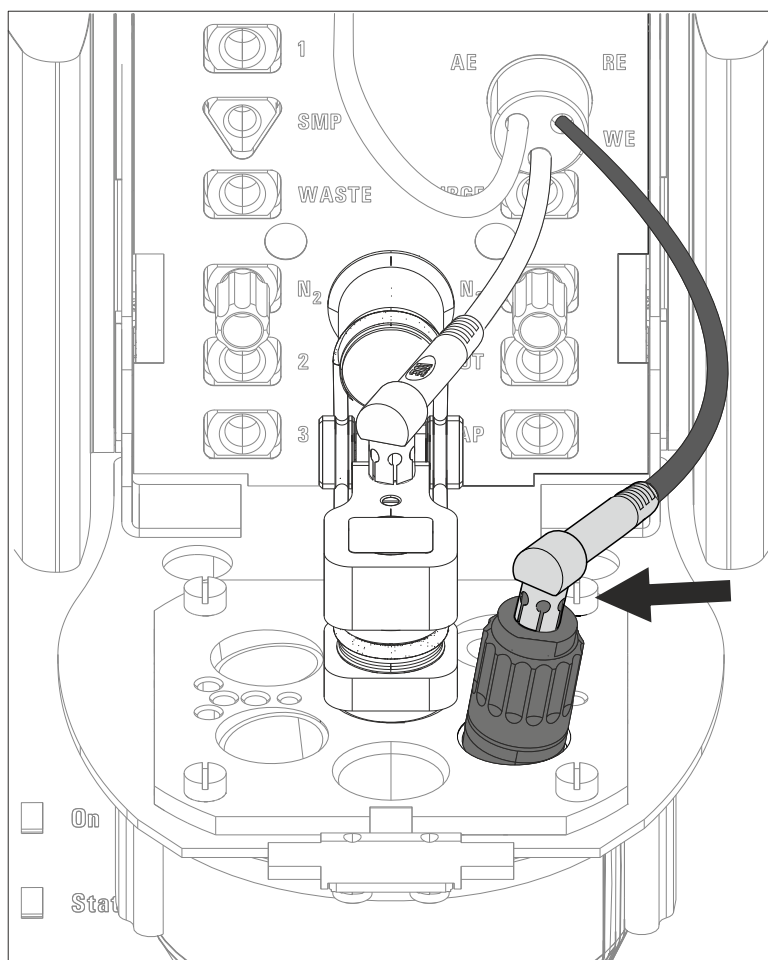


Figure 45 Connecting a reference electrode

3.3.2.3 Auxiliary electrode (AE)

The auxiliary electrode (e.g. 6.0343.100) can be placed directly in the measuring head.

Inserting the auxiliary electrode

Proceed as follows:

- 1 Insert the auxiliary electrode into the opening (9-23) of the measuring head insert.

2



CAUTION

The electrode cables for the reference, working and auxiliary electrode look identical. Observe the markings on the plugs, because the 3 cables must not be mixed up.

Plug the electrode cable (8-7) with the **AE** marking on the plug onto the metal contact of the auxiliary electrode.

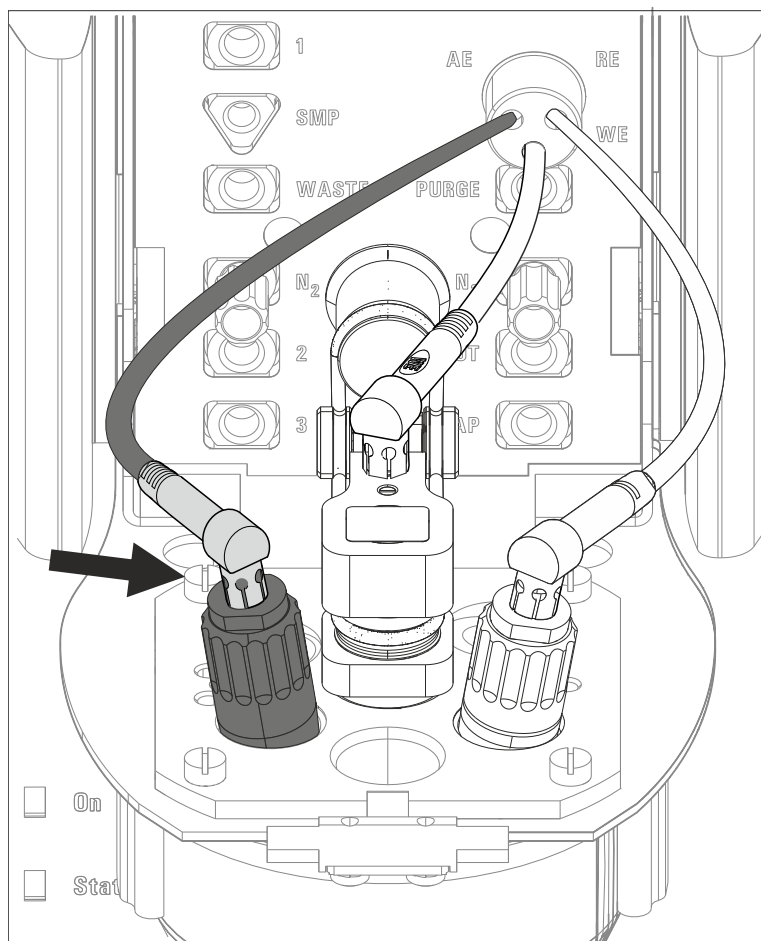


Figure 46 Connecting the auxiliary electrode

3.3.3 Inserting the RDE measuring head

Once the RDE measuring head has been fully equipped, it can be inserted on the measuring head arm. Proceed as follows:

1 Installing the measuring head cover

Place the measuring head cover at an angle of approx. 45° in the guide bolt in the front part of the measuring head insert.

Fold back the measuring head cover and gently push it in place.

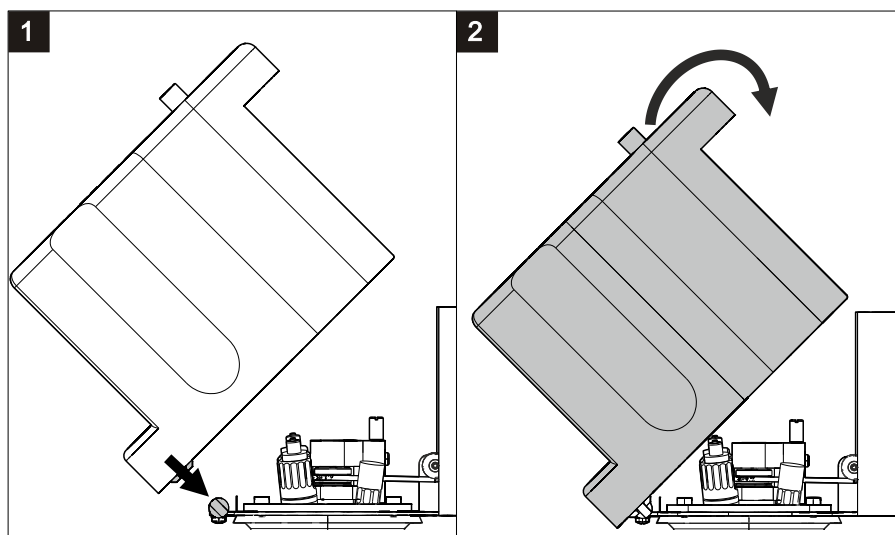


Figure 47 Installing the measuring head cover

The measuring head cover must snap into place with an audible click.

2 Inserting the stopper

Insert the stopper (3-5) into the pipetting opening.

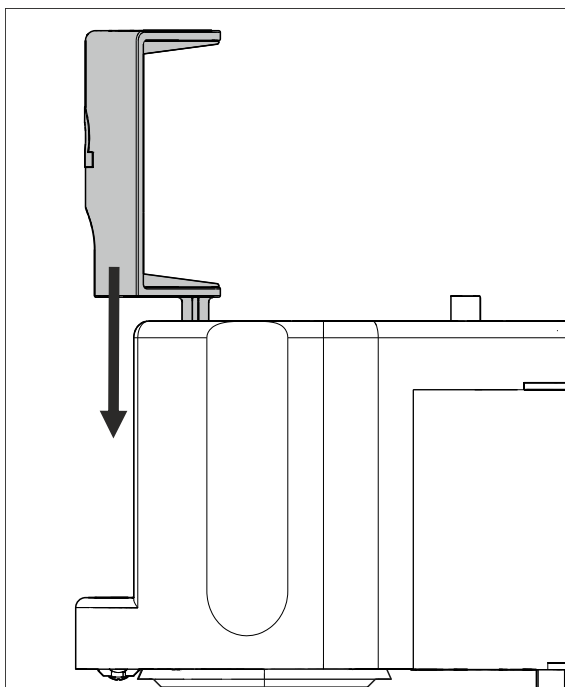


Figure 48 Inserting the stopper in the pipetting opening

3 Inserting the measuring head



WARNING

If the measuring head arm is folded down without due care, this may result in injuries to the hands.

Make sure that your fingers do not get caught between the measuring head arm and the instrument housing.



CAUTION

Do not apply pressure to the drive disk on the connector plate of the measuring head arm. Otherwise, the stirrer motor may be damaged.

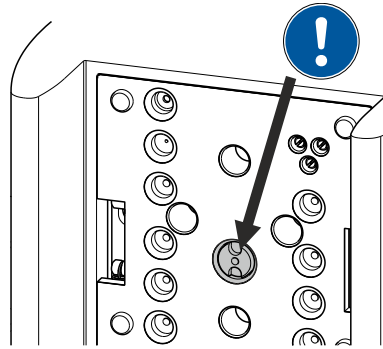


Figure 49 Do not touch the drive disk

Use one hand to hold the measuring head arm on the rear and use the other hand to insert the measuring head into the connector plate of the measuring head arm.

The measuring head must snap into place with an audible click.

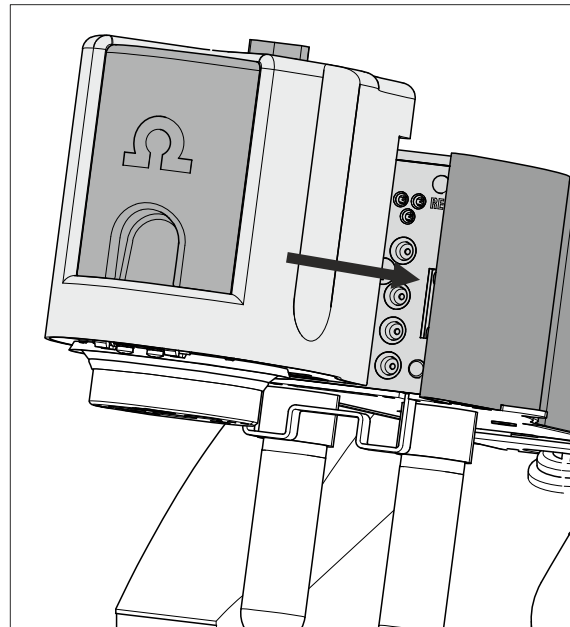


Figure 50 Inserting the measuring head

3.3.4 Connecting the inert gas supply



NOTICE

Only connect the inert gas supply if the RDE measuring head is used for VA trace analysis.

If the RDE measuring head is used for CVS analysis, then no inert gas supply is necessary.

2 Connecting the inert gas inlet

- Connect one end of the PVC tubing (6.1801.080) on the **N₂** nipple of the 884 Professional VA.
- Connect the other end of the PVC tubing (6.1801.080) to the inert gas bottle connection.
- Set the inert gas pressure on the gas bottle to $p = 1.0$ to 1.2 bar (or 14.5 to 17.4 psi or 0.1 to 0.12 MPa) using the reducing valve.
- Open the gas inlet on the gas bottle.

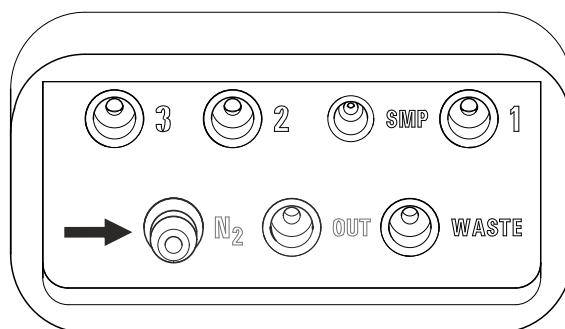


Figure 52 Nipple for inert gas supply

3.4 Equipping the SPE measuring head



CAUTION

The measuring head insert (see figure 13, page 29) is made of PTFE. Do not use sharp objects around it to ensure the material is not damaged.

3.4.1 Preparing the SPE measuring head



NOTICE

For equipping, Metrohm recommends placing the SPE measuring head in the measuring head holder and only then inserting it onto the measuring head arm.

- 1 Remove the stopper (11-5) from the pipetting opening to remove the measuring head cover.

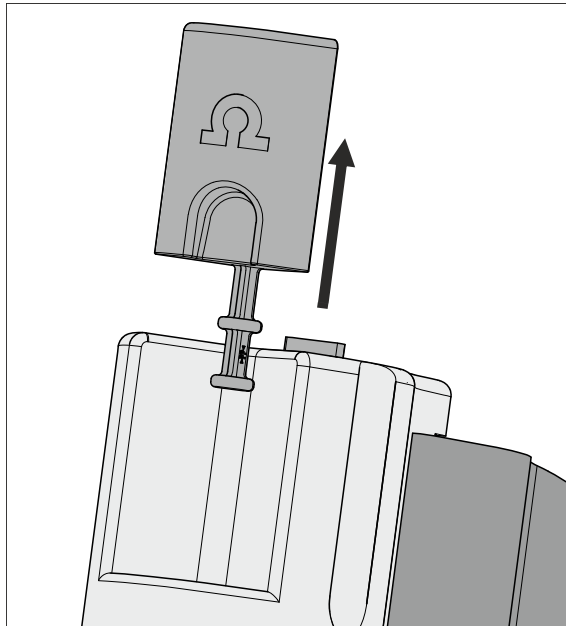


Figure 53 Removing the stopper from the pipetting opening

- 2 Pull the slide lock (11-4) on the top of the measuring head cover towards you and, at the same time, tilt the measuring head cover to an angle of approx. 45° and remove it.

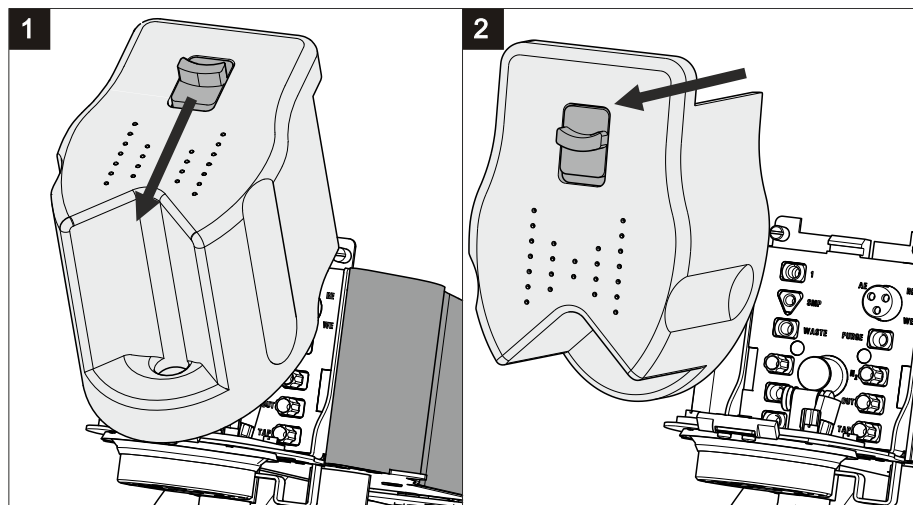


Figure 54 Removing the measuring head cover

3 Connecting the gas inlet

- Insert the PTFE tubing for adding gas to the solution (6.1829.030) through the opening (13-18).
- Pull the transparent inner tubing through as far as it will go.
- Ensure that the green kink protection is protecting the entire piece of tubing.

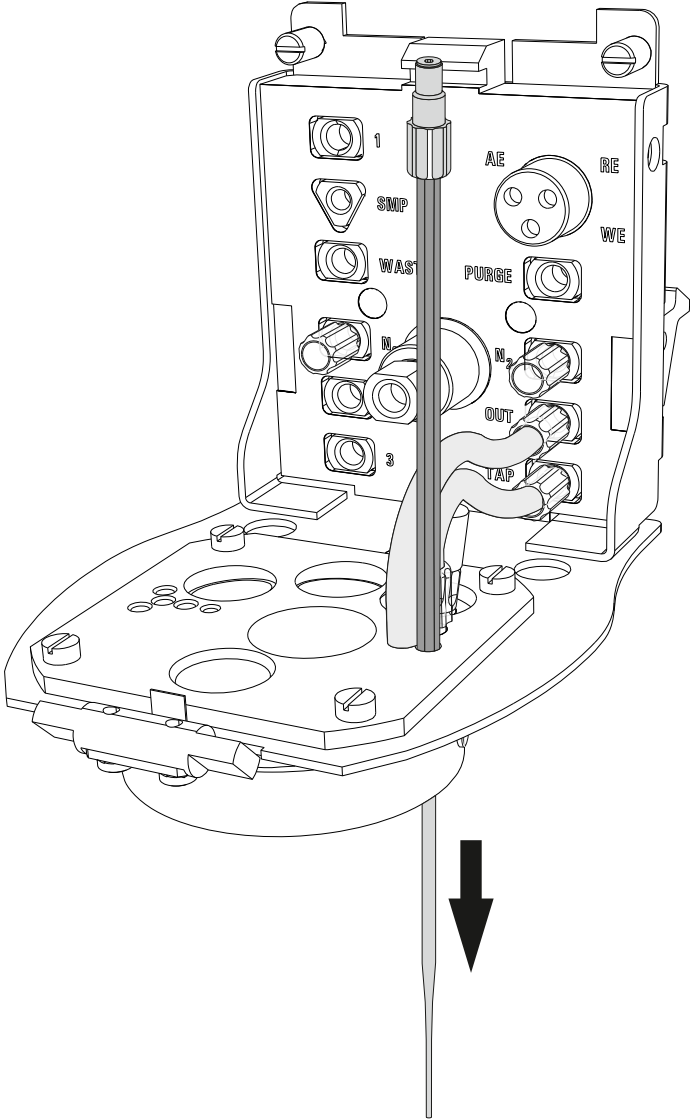


Figure 55 Inserting the gas inlet

- Connect the tubing to the PURGE threaded opening (12-8) and tighten it hand-tight.
- Finally, tighten the tubing nipple using the wrench provided (6.2739.000).

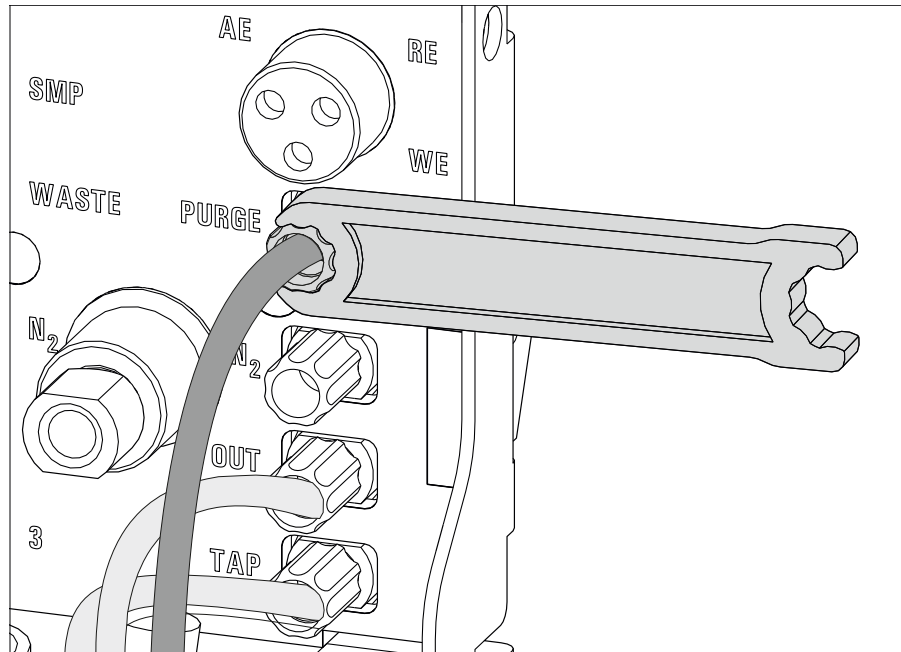


Figure 56 Connecting the gas inlet

4 Inserting the stirrer

- Screw one end of the flexible shaft to the stirrer using the clamping screw. While fastening the flexible shaft, push it through as far as it will go.
- Tighten the flexible shaft. To do so, screw the clamping screw for the flexible shaft into the stirrer using 2 wrenches (6.2739.000). In the process, ensure that the flexible shaft is not kinked.

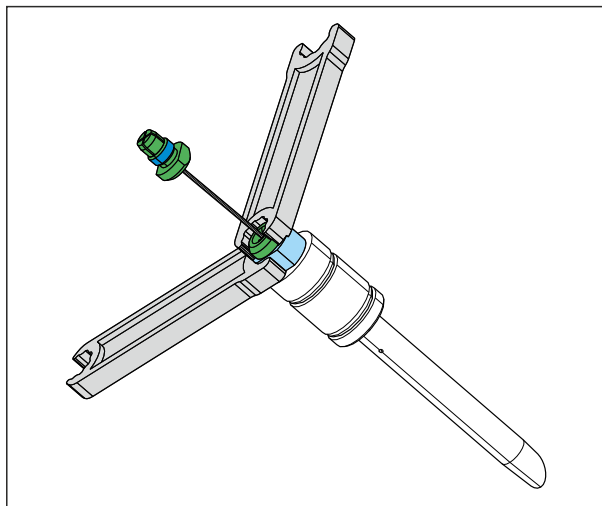


Figure 57 Screwing in the flexible shaft

- Insert the stirrer into the opening (13-14) and press it down as far as it will go.

- Fasten the other end of the flexible shaft to the drive shaft (12-9) using the second clamping screw. While doing so, push the flexible shaft through far enough so that the course is as straight as possible.
- Screw the clamping screw for the flexible shaft to the drive shaft using 2 wrenches (6.2739.000). In the process, ensure that the flexible shaft is not kinked.

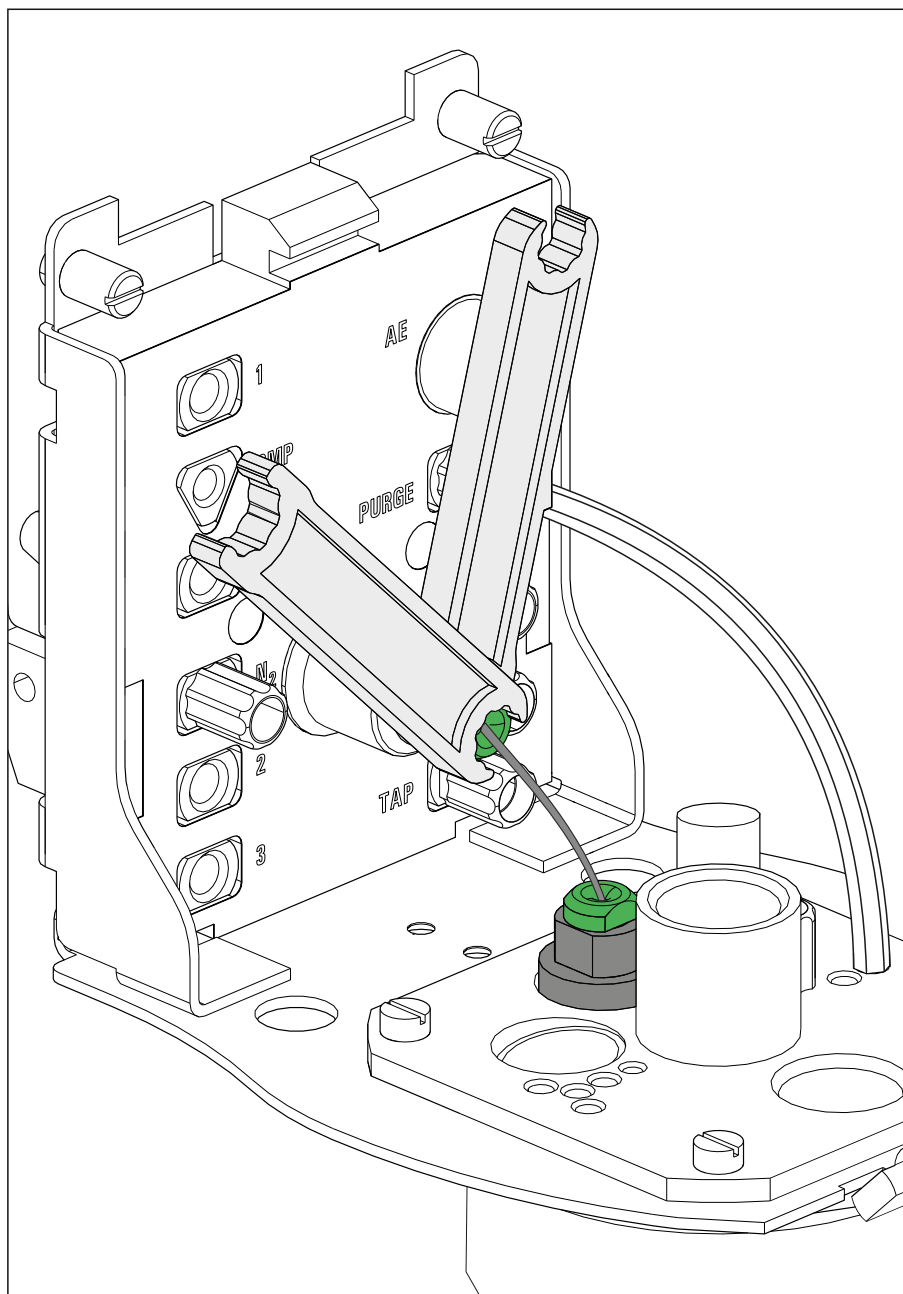


Figure 58 Inserting and connecting the stirrer

5 Inserting the stopper

- If the openings (13-21)-(13-26) are not needed (for manual operation), seal them with the stoppers provided (6.2709.110).



NOTICE

The stopper shown in light blue in the figure has a smaller diameter than the others. Keep this in mind when inserting the stopper.

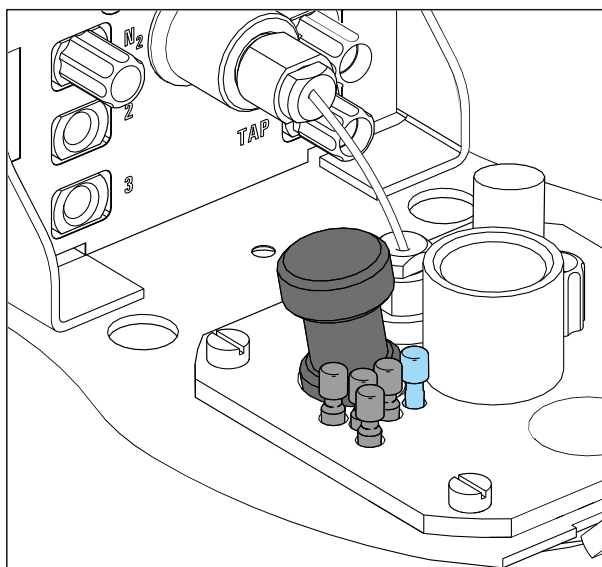


Figure 59 Inserting the stopper

3.4.2 Preparing the electrode and inserting it in the SPE measuring head

The 884 Professional VA uses the 3-electrode principle. The following electrodes are located on the screen-printed electrode (SPE):

- Working electrode (WE)
- Reference electrode (RE)
- Auxiliary electrode (AE)



NOTICE

Also observe the notes contained in the electrode leaflets that can be downloaded from the [Metrohm website](#) using the corresponding article number.

Preparing and inserting the electrode

1 Preparing the electrode



NOTICE

Only hold the electrode by its edges. Contaminations on the electrode surface may falsify the measurement curves.

Prepare the electrode holder and the electrode according to the instructions in the *Electrode shaft for screen-printed electrodes (SPE)* document (8.0109.8014XX). Carry out the following tasks:

- Preparing the electrode holder
 - Insert the silicone seal in the electrode shaft
 - Position the supporting ring
 - Close the electrode shaft with the nut
- Inserting the electrode
 - Align the electrode with the symbol on the electrode shaft
 - Insert the electrode in the electrode shaft
 - Tighten the nut

2 Inserting the electrode holder in the measuring head insert

Insert the electrode holder with the electrode from above into the opening for the electrode (13-**19**).

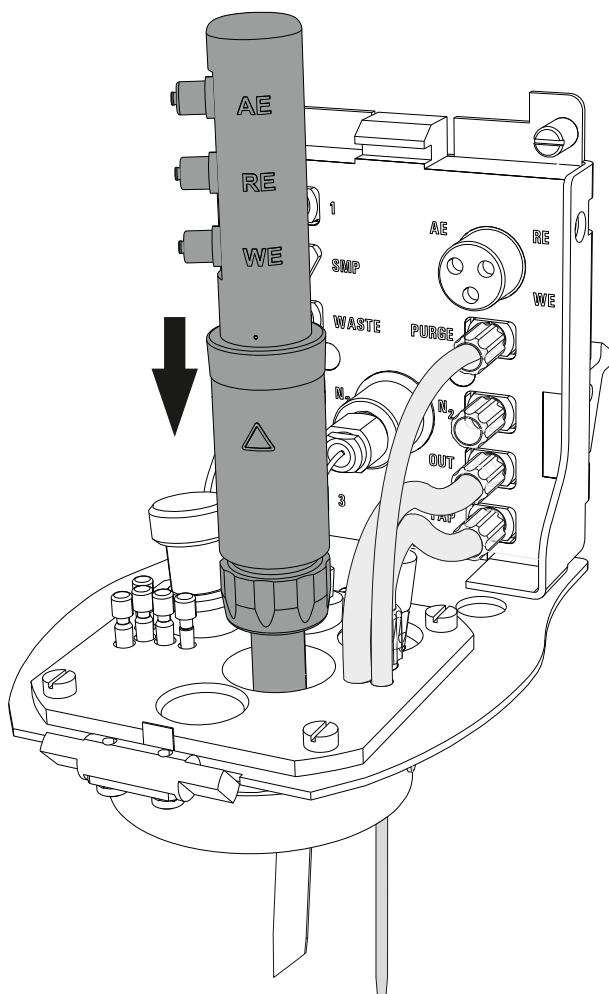


Figure 60 Inserting the electrode holder

- 3 Align the printed side of the electrode with the stirrer.

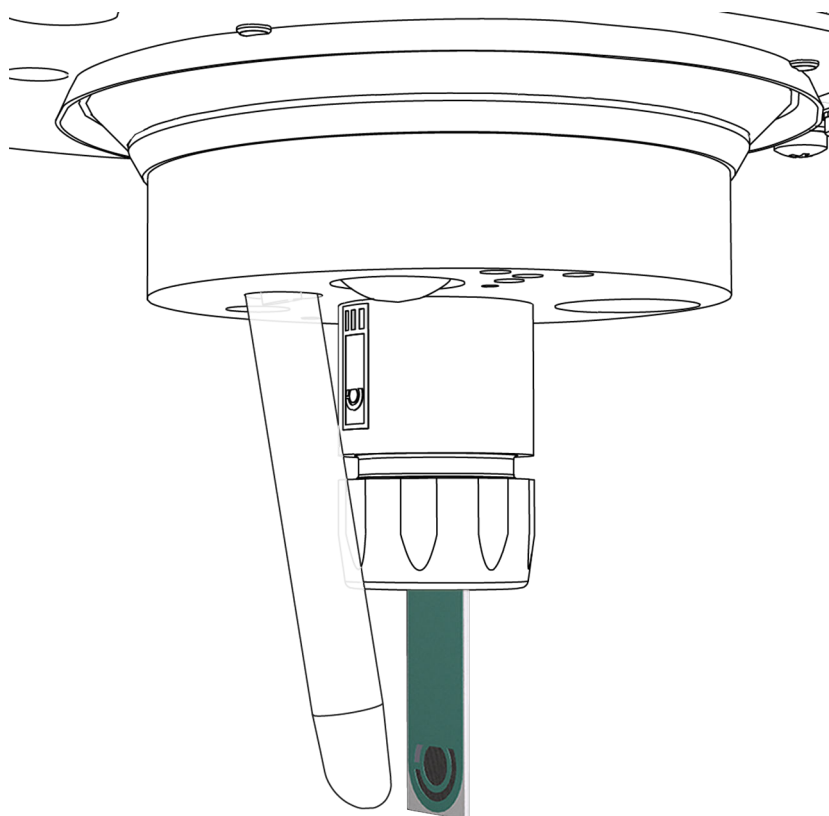


Figure 61 Aligning the electrode

Connecting electrodes



CAUTION

The electrode cables for the reference, working and auxiliary electrode look identical. Observe the markings on the plugs. The 3 cables must not be mixed up.

1 Connecting the working electrode

Plug the electrode cable (12-7) with the **WE** marking on the plug onto the corresponding metal contact **WE** of the electrode shaft.

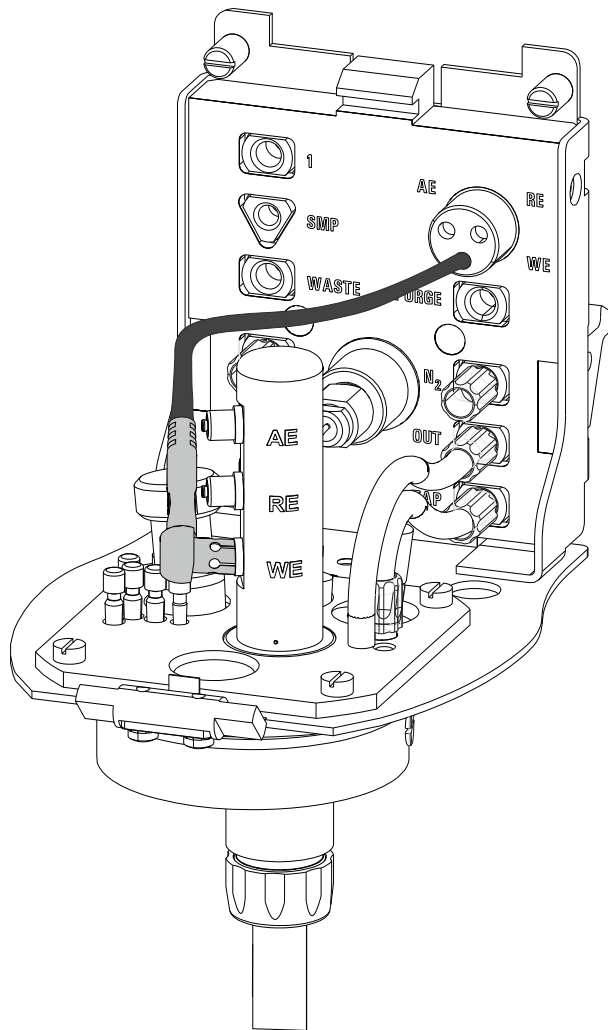


Figure 62 Connecting the working electrode

2 Connecting a reference electrode

Plug the electrode cable (12-7) with the **RE** marking on the plug onto the corresponding metal contact **RE** of the electrode shaft.

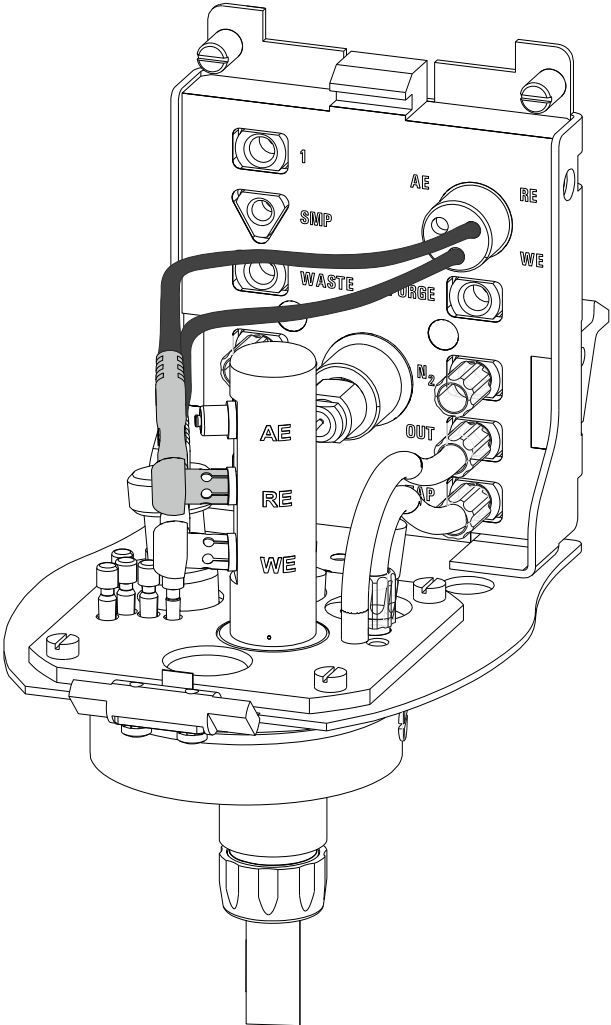


Figure 63 Connecting a reference electrode

3 Connecting the auxiliary electrode

Plug the electrode cable (12-7) with the **AE** marking on the plug onto the corresponding metal contact **AE** of the electrode shaft.

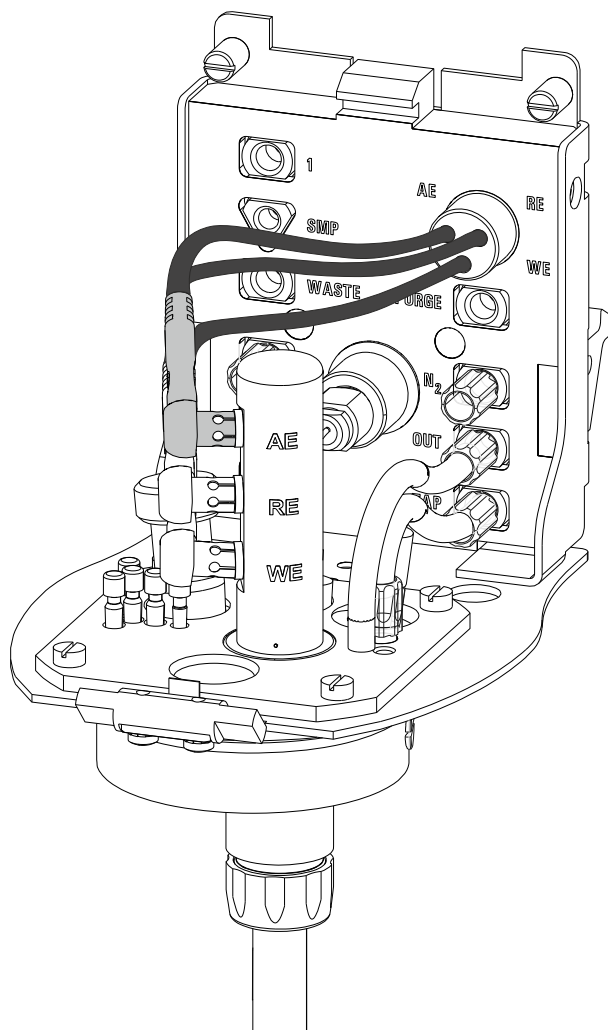


Figure 64 Connecting the auxiliary electrode

3.4.3 Inserting the SPE measuring head

Once the SPE measuring head has been fully equipped, it can be inserted on the measuring head arm. Proceed as follows:

1 Installing the measuring head cover

Place the measuring head cover at an angle of approx. 45° in the guide bolt in the front part of the measuring head insert.

Fold back the measuring head cover and gently push it in place.

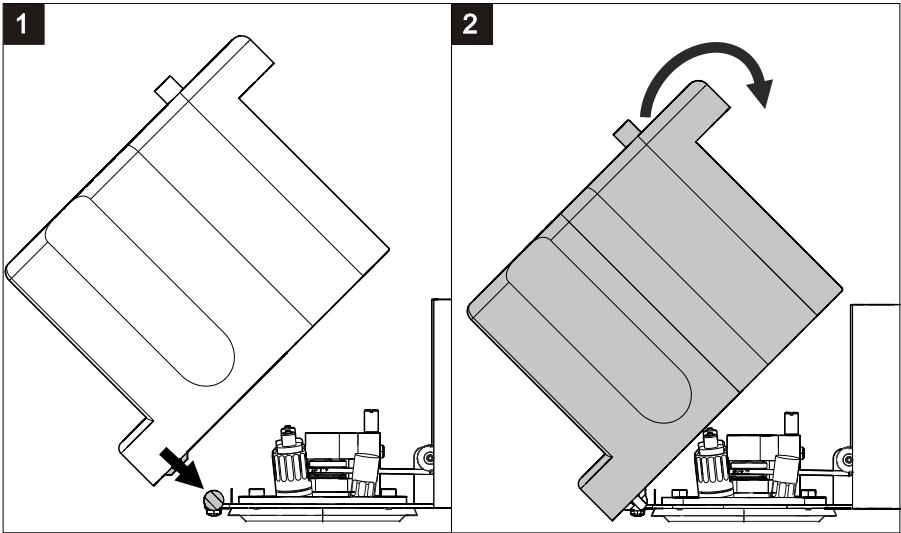


Figure 65 Installing the measuring head cover

The measuring head cover must snap into place with an audible click.

2 Inserting the stopper

Insert the stopper (3-5) into the pipetting opening.

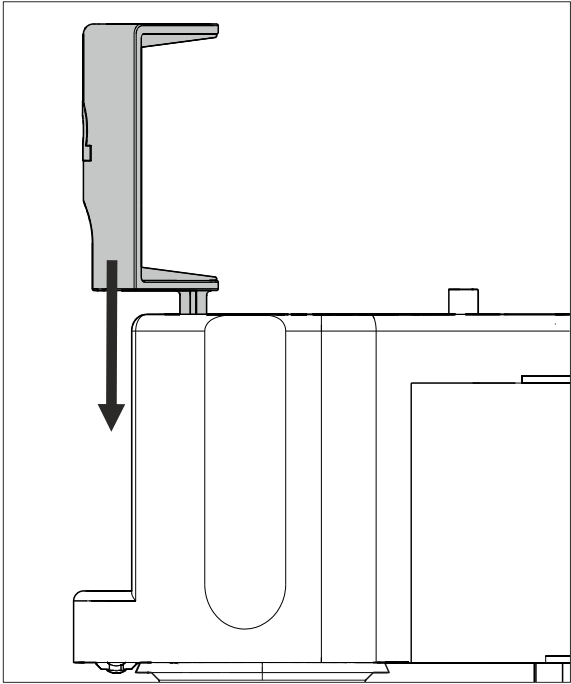


Figure 66 Inserting the stopper in the pipetting opening



3 Inserting the measuring head



WARNING

If the measuring head arm is folded down without due care, this may result in injuries to the hands.

Make sure that your fingers do not get caught between the measuring head arm and the instrument housing.



CAUTION

Do not apply pressure to the drive disk on the connector plate of the measuring head arm. Otherwise, the stirrer motor may be damaged.

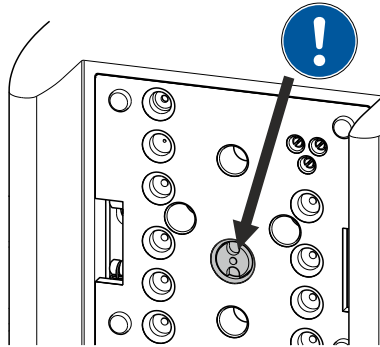


Figure 67 Do not touch the drive disk

Use one hand to hold the measuring head arm on the rear and use the other hand to insert the measuring head into the connector plate of the measuring head arm.

The measuring head must snap into place with an audible click.

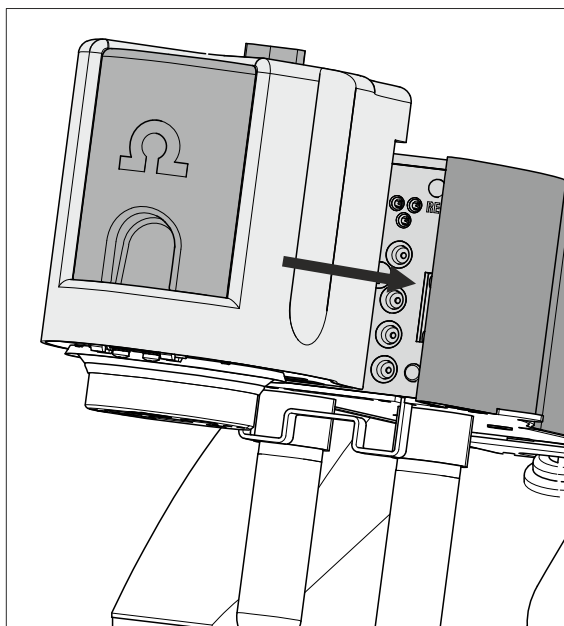


Figure 68 Inserting the measuring head

3.4.4 Connecting the inert gas supply

Generally, nitrogen (N_2) is used as inert gas in VA trace analysis for purging the measuring solution and for operating the MME pro, the SPE and the RDE. Only nitrogen of sufficient purity may be used for this.

For general polarography/voltammetry:

- 4.5 ($w(N_2) = 99.995\%$)

For analyses in organic solvents; for determinations that result in very high current strengths (such as for determining the smallest concentrations without preceding deposition)

- 5.0 ($w(N_2) = 99.999\%$)

1 Filling the gas washing glass

- Unscrew the gas washing glass (1-6) from the measuring head arm.
- Fill the gas washing glass as follows:
 - Standard: Fill the gas washing glass halfway with distilled H_2O .
 - For long-term measurement with base electrolytes like acetic acid/acetate buffer solution or ammonia/ammonium chloride buffer solution, add the base electrolyte.
 - For measurements in organic solvents, fill with the solvent being used.
- Screw the gas washing glass back onto the measuring head arm.

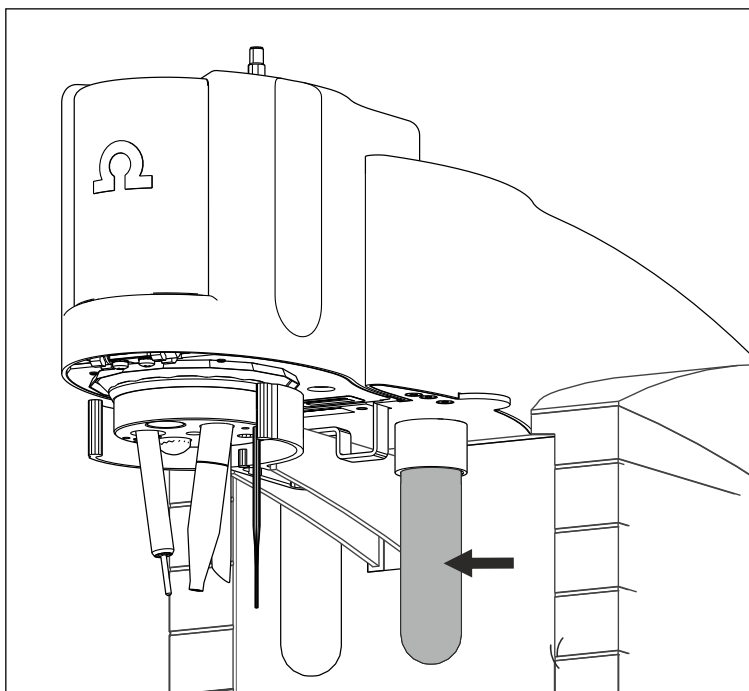


Figure 69 Gas washing glass

2 Connecting the inert gas inlet

- Connect one end of the PVC tubing (6.1801.080) on the **N₂** nipple of the 884 Professional VA.
- Connect the other end of the PVC tubing (6.1801.080) to the inert gas bottle connection.
- Set the inert gas pressure on the gas bottle to $p = 1.0$ to 1.2 bar (or 14.5 to 17.4 psi or 0.1 to 0.12 MPa) using the reducing valve.
- Open the gas inlet on the gas bottle.

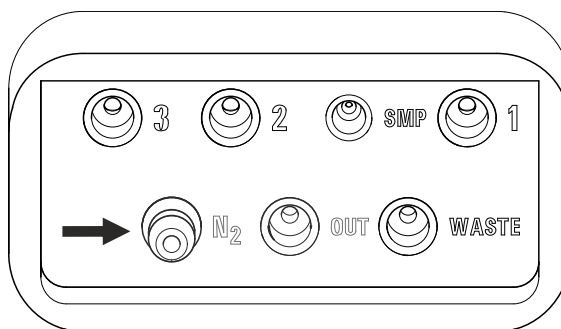


Figure 70 Nipple for inert gas supply

3.5 Connecting instruments electrically

3.5.1 Connecting the instrument to the power grid



WARNING

Electric shock from electrical potential

Risk of injury by touching live components or through moisture on live parts.

- Never open the housing of the instrument while the power cord is still connected.
- Protect live parts (e.g. power supply unit, power cord, connection sockets) against moisture.
- Unplug the power plug immediately if you suspect that moisture has gotten inside the instrument.
- Only personnel who have been issued Metrohm qualifications may perform service and repair work on electrical and electronic parts.

Connecting the power cord

Accessories

Power cord with the following specifications:

- Length: max. 2 m
- Number of cores: 3, with protective conductor
- Instrument plug: IEC 60320 type C13
- Conductor cross-section 3x min. 0.75 mm² / 18 AWG
- Power plug:
 - according to customer requirement (6.2122.XX0)
 - min. 10 A



NOTICE

Do not use a not permitted power cord!

1 Plugging in the power cord

- Plug the power cord into the instrument's power socket.
- Connect the power cord to the power grid.

3.5.2 Connecting the 884 Professional VA

The 884 Professional VA is connected to the computer with the supplied controller cable.

Connecting the computer

- 1 Connect the controller cable (6.2151.000) to the "Controller" connector of the 884 Professional VA.



NOTICE

The plug on the controller cable is protected against accidental disconnection by means of a pull-out protection feature. If you wish to pull out the plug, you first need to pull back the outer plug sleeve.

- 2 Connect the USB plug of the controller cable to an available USB connector on the computer.

Initializing the 884 Professional VA in viva

- 1 Start **viva**.

The following dialog window is displayed:



- 2 Click on **Yes**.

The following dialog window is displayed:

Properties - 884 Professional VA - 884_2

General | GLP

Device name: 884_1

Device type: 884 Professional VA

Program version: 5.884.0012

Device serial number: 02117

FPGA version: 122

Set to work: 2015-06-23 09:26:27 UTC+2

Remarks:

OK Cancel

3 Change the suggested device name if required.

4 Confirm with **OK**.

The instrument will be automatically listed in the device table of the **Configuration** program part.

3.5.3 Connecting an 800 Dosino

Up to 4 dosing devices of the type 800 Dosino can be connected directly to the 884 Professional VA. As an alternative, the dosing devices can be connected via an 846 Dosing Interface, a sample changer or any other supported instrument that also has MSB outputs.



NOTICE

An 800 Dosino is connected to Metrohm instruments via an MSB connector. Make sure that the flat side of the plug matches the marking on the socket.

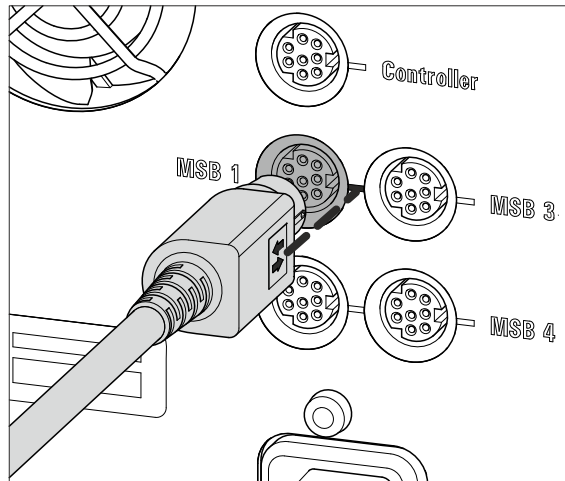


Figure 71 Connecting a dosing device to an MSB socket



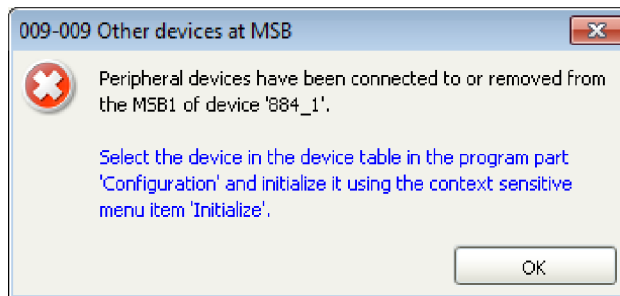
NOTICE

Information regarding assembling a Dosino with the dosing unit as well as operation and maintenance is available in the manual of the 800 Dosino.

Connecting an 800 Dosino with dosing unit directly to the 884 Professional VA

- 1 Connect the connection cable of the 800 Dosino to one of the 4 MSB connectors (2-8) of the 884 Professional VA.

The following dialog window is displayed:



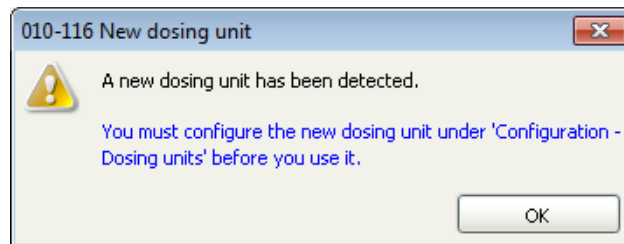
- 2 Confirm with **OK**.

Initializing a dosing unit in viva

1 Select the 884 Professional VA in the device table of the **Configuration** section of the program.

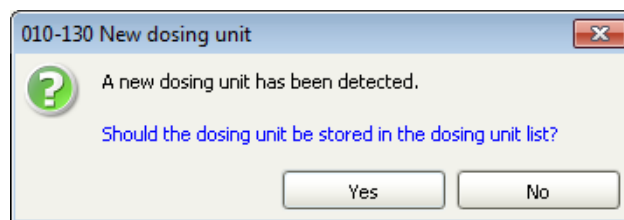
2 In the device table, click on the **Edit** button and select **Initialize**.

If a brand-new dosing unit is connected, the following dialog window is displayed:



Or:

If a dosing unit is connected that has been previously configured, then the following dialog window is displayed:



3 Click on **OK** if a brand-new dosing unit is used.

The following dialog window is displayed:

Dosing unit - [GLP]

Hardware

Name

Comment

Device name / dosing device

Order number

Serial number

Cylinder volume mL

Cylinder serial number

Parameters for preparation

Dosing port Prep/Empty

Dosing rate Dosing port 1 mL/min

Dosing rate Dosing port 2 mL/min

Dosing rate Fill port mL/min

Dosing rate Special port mL/min

Tubing parameters

	Port	Length	Diameter
Dosing port 1	<input type="text" value="Port 1"/>	<input type="text" value="80.0"/> cm	<input type="text" value="0.3"/> mm
Dosing port 2	<input type="text" value="Port 3"/>	<input type="text" value="0.0"/> cm	<input type="text" value="2.0"/> mm
Fill port	<input type="text" value="Port 2"/>	<input type="text" value="25.0"/> cm	<input type="text" value="2.0"/> mm
Special port	<input type="text" value="Port 4"/>	<input type="text" value="0.0"/> cm	<input type="text" value="2.0"/> mm

Valve disk

Rotating direction

Not over

OK Cancel

- 4 Configure the new dosing unit in this dialog window.



NOTICE

Under **Tubing parameters**, adapt the parameters **Length** and **Diameter** to the actual installation. This ensures that functions such as **Prepare** or **Empty** work properly in **viva**. The lengths and diameters of the tubing connections incorporated in the measuring head arm can be found in the appendix of the detailed manual.

- 5 Click on **Yes** if you are using the already configured dosing unit.

The dosing unit will be automatically displayed in the **Dosing units** subwindow of the **Configuration** program part.



NOTICE

Check the **Tubing parameters** and adapt them to the actual installation, if necessary.

4 Start-up

The 884 Professional VA is operated exclusively via the **viva** computer software. You can find information on operating **viva** in the online help and in the VA and CVS tutorials.

Proceed as follows for the initial start-up of the 884 Professional VA:

Preparing the system for starting up



WARNING

Uncontrolled splashing of reagents

Splashing reagents may result in injuries.

Operate the 884 Professional VA only with the measuring head in place and the measuring head arm lowered.

- 1 Insert the measuring head as described in *"Preparing the RDE measuring head"*, page 53.
- 2 Equip the measuring head with the electrodes (*see chapter 3.3.2, page 56*).
- 3 Insert the measuring vessel into the holder (1-3).

4



WARNING

If the measuring head arm is folded down without due care, this may result in injuries to the hands.

Make sure that your fingers do not get caught between the measuring head arm and the instrument housing.

Lower the measuring head arm.

- 5 Place the drip pan (6.2711.090) into the drip pan holder (1-8).
- 6 Connect the instruments electrically (*see chapter 3.5, page 83*).

Activating the calibrator

The calibrator built into the 884 Professional VA guarantees a very high measuring accuracy for 2 years after the initial start-up. You can find more detailed information in the chapter *Calibrator* of the detailed manual.

In **viva**, proceed as follows:

- 1 Select the 884 Professional VA in the device table of the **Configuration** section of the program.
- 2 In the device table, click on the **Edit** button and select **Properties....**
- 3 Open the **Calibrator** tab.

- 4 Click on **Activate calibrator** and then on **OK**.

The set-to-work date of the calibrator and the calibrator's serial number are displayed on the **Calibrator** tab after the dialog window has been closed and opened again.

Properties - 884 Professional VA - 884_4

General MSB 1 MSB 2 MSB 3 MSB 4 **Calibrator** GLP

Calibrator serial number

Set to work

Remarks

Monitor calibrator

Replacement interval days

Next check ...

Message

Message by e-mail

Acoustic signal

Action

Record message

Display message

Cancel determination



NOTICE

The calibration certificate is available online. Go to <http://www.metrohm.com/en/support-and-service/certificate-finder> and enter the serial number of the calibrator and download the certificate.

- 5 If required, adjust the settings on the **Calibrator** tab (e.g. **Message** or **Action**).

5 Operation and maintenance

5.1 Replacing the measuring head

Make sure that no determinations are being carried out when you replace the measuring head.



WARNING

Leaking of chemical substances

Chemical substances can cause chemical burns and skin damage.

- Empty the tubing before you remove the measuring head.
- Tilt the measuring head arm up before you remove the measuring head.



CAUTION

LED blinking pattern indicates standby potential

The electrodes may be damaged.

Check the blinking pattern of the "Status" LED. The measuring head may not be removed while standby potential is being applied to the electrodes (blinking pattern: on for a long time - off for a short time).



CAUTION

Stirrer motor is in operation

The stirrer motor may be damaged.

Switch off the stirrer motor before you remove or insert the measuring head.

Proceed as follows:

- 1 Tilt the measuring head arm up.
- 2 Hold the measuring head with both hands, push the metal clip on the bottom of the measuring head arm upwards and, at the same time, pull the measuring head away.

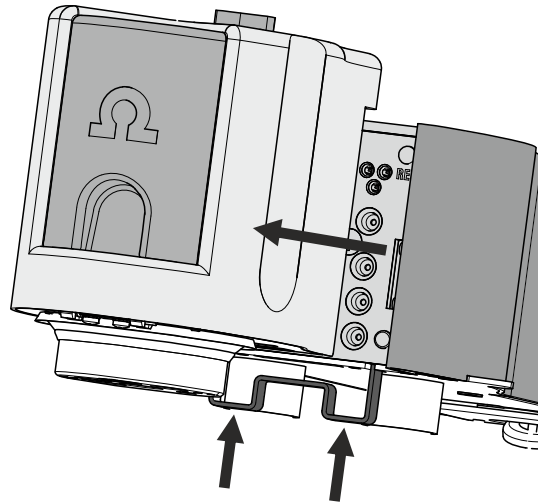


Figure 72 Removing the measuring head

- 3 Place the measuring head with the electrodes and tubings in the park station.



NOTICE

If the measuring head is not used for an extended period, then the reference electrode must be removed from the measuring head and stored separately. Observe the notes on maintenance and care in the electrode leaflet.

- 4

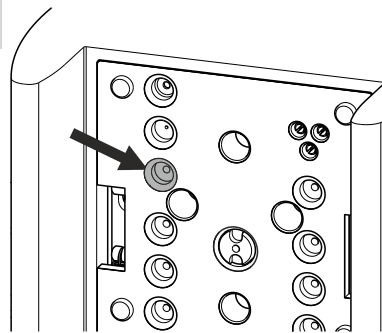


Figure 73 Rear WASTE connector

When using a Multi-Mode Electrode pro along with additional automated aspiration of the measuring solution, watch for traces of mercury in the indicated connector (WASTE) when removing the MME measuring head. Remove any traces using a mercury drop catcher (6.2406.000).

5

**CAUTION**

Do not apply pressure to the drive disk on the connector plate of the measuring head arm, as this could damage the stirrer motor.

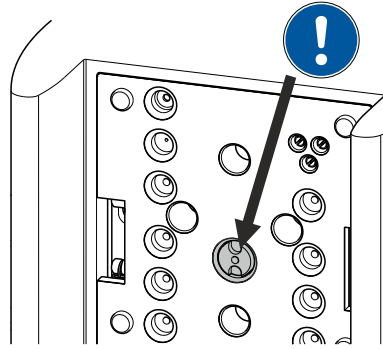


Figure 74 Do not touch the drive disk

Use one hand to hold the rear of the measuring head arm and use the other hand to insert the new measuring head into the connector plate of the measuring head arm.

The measuring head must snap into place with an audible click.

6

**WARNING**

If the measuring head arm is folded down without due care, this may result in injuries to the hands.

Make sure that your fingers do not get caught between the measuring head arm and the instrument housing.

Lower the measuring head arm again.



5.2 Performing a Dummy cell test

Should you note any problems or irregularities during or after determinations (e.g. noisy curves), you can perform a dummy cell test. In this test, the hardware and the electrode cables up to the measuring head are checked; this allows potential problems to be localized or excluded. The electrodes are not tested with the **Dummy cell test**.

Proceed as follows:

- 1** Load the **Dummy cell test** method template in **viva**.
- 2** Plug the 3 electrode cables onto the contacts of the dummy cell (6.2813.050).
Observe the correct assignment of the electrode cables (WE, RE and AE).
- 3** Place the measuring head cover and the stopper (**3-5**) onto the measuring head.
- 4** Start the determination; at the prompt, select the name of the 884 Professional VA being used from the list and wait until the measurement is completed.

If the curve meets the following conditions, then defects in the hardware or the electrode cables can be ruled out:

- The curve must be linear.
- At -2.0 V, the current should be -1.67 mA \pm 0.33 mA.
- At $+2.0$ V, the current should be $+1.67$ mA \pm 0.33 mA.

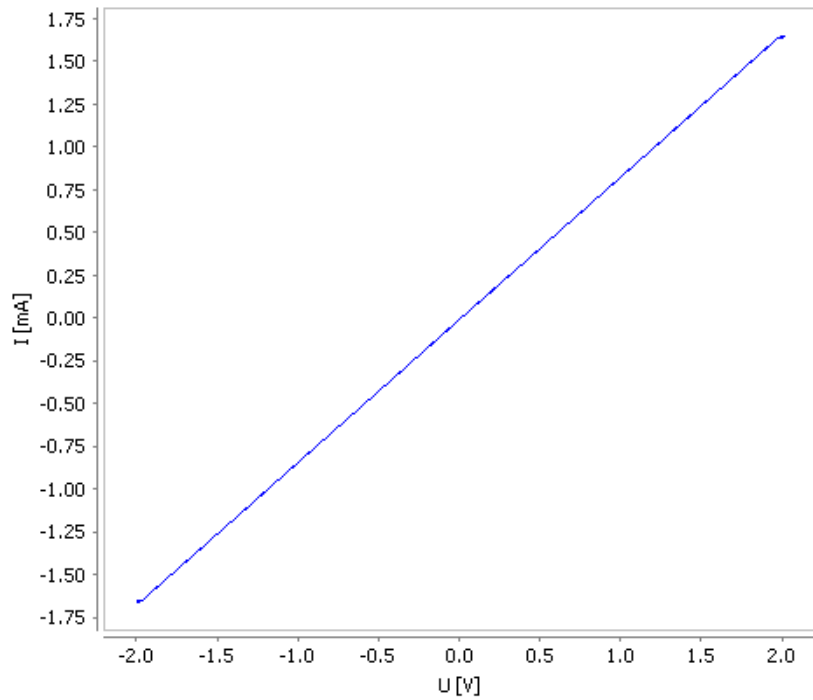


Figure 75 Dummy cell test – Ideal curve progression

- 5 If the resulting curve is not consistent with this representation and the problems with the determinations persist, contact the local Metrohm Service.

6 Troubleshooting

6.1 List of faults

6.1.1 General problems

Problem	Cause	Remedy
An electrode cable has broken.	<i>The cable has accidentally been jammed in the measuring head cover or a cable contact has been kinked.</i>	Replace the electrode cable set .
Solution is leaking between the measuring instrument and the measuring head.	<i>The measuring head is not correctly locked in place on the measuring head arm.</i>	Let the measuring head snap into place. The click must be audible.
	<i>The sealing rings have aged or are defective.</i>	Contact Metrohm Service.
The electrode test fails.	<i>One or several electrodes are not connected.</i>	Check the electrode cable connections.
	<i>One or several electrodes are defective.</i>	Perform maintenance in accordance with the electrode leaflet. You can find more detailed information at http://va-electrodes.metrohm.com .
	<i>The measuring vessel contains too little solution or is empty.</i>	Check the fill level in the measuring vessel and add solution if necessary.
The measured values are widely scattered.	<i>The solutions are pipetted manually.</i>	Use an 800 Dosino with dosing unit.
	<i>The solutions are not added via the pipetting opening.</i>	Add solutions only via the pipetting opening .
	<i>The solutions are metered automatically: Tubing connections are not sealed or the 4-way micro dosing tip for adding standard solutions is not immersed in the measuring solution.</i>	Check the tubing connections and the 4-way micro dosing tip and replace if necessary.

Problem	Cause	Remedy
	<i>One of the electrodes (normally the working or reference electrode) is not operational.</i>	Service the electrode or replace the electrode in the case of a solid-state electrode (e.g. platinum RDE).
	<i>The stirrer or RDE is not rotating properly.</i>	Inspect the drive. Service or replace the drive if necessary.
		For other application-specific problems, observe (see chapter 6.1.2, page 99) and (see chapter 6.1.3, page 109).
The measuring vessel overflows.	<i>Incorrect pump times have been defined in viva.</i>	Adjust the pump times.
	<i>The volumes defined in the dosing commands in viva are too large.</i>	Reduce the volumes.
The peak is no longer recognized.	<i>The reference potential has shifted.</i>	Perform the maintenance procedure for the reference electrode in accordance with the electrode leaflet. You can find more detailed information at http://va-electrodes.metrohm.com .
	<i>One or more of the solutions in use (water, electrolyte, VMS, etc.) has become contaminated.</i>	Apply fresh solution; use water from a different source.

6.1.2 884 Professional VA for VA trace analysis

Problem	Cause	Remedy
A peak is not found in either the sample or for the standard addition.	<i>The peak is not within the sweep range.</i>	Check Start potential and End potential of the sweep in viva .
	<i>The electrolyte solution is too old.</i>	Produce new electrolyte solution. Organic additives may only last 1 day or less.
	<i>Organic constituents interfere with analysis.</i>	Carry out UV digestion or equivalent sample preparation.
	<i>The complexing agent has been omitted (adsorptive stripping voltammetry).</i>	Use complexing agent.
	<i>No drops form at the capillary.</i>	<ul style="list-style-type: none"> ▪ Check the MME pro. ▪ Adjust the needle and capillary.

Problem	Cause	Remedy
		<ul style="list-style-type: none"> ▪ If necessary, replace the capillary or needle (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>).
	<i>The pH value of the measuring solution is not correct.</i>	Check the pH value and adjust it by adding a buffer, acid or base if necessary.
A peak was not found when measuring the sample but the standard addition is being evaluated correctly.	<i>The peak in the sample has shifted.</i>	Ensure that the peak actually originates from the analyte. If it does, set the characteristic potential and have the results recalculated. If it does not, locate the cause based on "Double peak present" and resolve the problem.
	<i>The concentration of the ion to be determined is too small.</i>	<ul style="list-style-type: none"> ▪ Use more sample. ▪ Use stripping voltammetry (HMDE) instead of polarography (DME, SMDE) if the application allows. ▪ Extend the deposition time (only HMDE).
	<i>The deposition time for stripping voltammetry is too short.</i>	In the voltammetry command (DP, SQW), increase the deposition time under Potentiostatic pretreatment .
A slight hissing noise can be heard at the measuring head.	<i>The measuring head is not correctly locked in place on the instrument. This can allow nitrogen to escape at the connection.</i>	Remove the measuring head and put it back in place until it clearly clicks in place.
	<i>The seals at the transitions are too old.</i>	Contact Metrohm Service for how to proceed.
Contacts for the SPE are corroded.	<i>Repeated penetration of liquids into the electrode shaft.</i>	Replace the electrode holder.
Curves have a large amount of noise (all electrode types).	<i>The needle is not adjusted.</i>	<ul style="list-style-type: none"> ▪ Adjust the needle (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>). ▪ In the case of an SMDE, alternatively use a DME if the application allows.
	<i>The capillary and/or needle is defective.</i>	Replace the capillary and needle. If necessary, clean the MME pro (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>)

Problem	Cause	Remedy
	<i>The tapping mechanism on the VA stand base is not functioning correctly.</i>	<ul style="list-style-type: none"> Check the positioning of the capillary in the MME pro. The capillary has to be centered in the retaining screw. The retaining screw is too loose or too tight. Use the wrench for MME (6.1247.220) to tighten the retaining screw to the right torque.
	<i>The electrolyte solution is too old.</i>	Produce new electrolyte solution. Organic additives may only last 1 day or less.
	<i>The mercury in the MME pro displays the black streaks of mercury oxide.</i>	Completely remove and clean the electrode (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>).
	<i>The reference electrode is not filled correctly (inside and outside).</i>	Top up the reference electrode.
	<i>The reference electrode's diaphragm is partially or completely blocked (e.g. from precipitation caused by incompatible solutions like KCl as a bridge electrolyte and HClO₄ as an electrolyte in the measuring solution).</i>	Ensure the compatibility of the chemistry. Replace the bridge electrolyte if necessary (such as using a NaCl or KNO ₃ solution in place of KCl).
Curves have a large amount of noise (with DME/SMDE).	<i>The electrode drips at irregular intervals.</i>	<ul style="list-style-type: none"> Check the tapping of the dripping on the MME pro. If necessary, center the capillary in the MME pro or readjust the anchoring of the capillary using the wrench for the MME (6.1247.220). Adjust the needle and capillary. If necessary, replace the capillary or needle (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>).
	<i>The electrode drips too quickly (with DME).</i>	Increase the voltage step time in the voltammetry command on the Sweep tab.
Curves have a large amount of noise (with HMDE).	<i>The electrode surface is overloaded.</i>	Check the deposition potential and time and reduce them if necessary.



Problem	Cause	Remedy
	<i>No drops form at the capillary.</i>	<ul style="list-style-type: none"> ▪ Check the nitrogen connection and pressure. ▪ Ensure that the measuring head is attached correctly and locked in place. ▪ Replace the capillary and needle (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>).
Curves have an unusual shape (with SPE).	<i>The electrode cables were connected to the wrong electrode contact.</i>	Install the electrode cables as follows: <ul style="list-style-type: none"> ▪ Connect the cable with the WE marking to the metal contact WE for the working electrode. ▪ Connect the cable with the RE marking to the metal contact RE for the reference electrode. ▪ Connect the cable with the AE marking to the metal contact AE for the auxiliary electrode.
	<i>The surface of the electrode was touched while installing the electrode.</i>	Replace the electrode. During assembly, only hold the electrode by its edges. Avoid contact with the electrode surface.
	<i>Measuring solution has penetrated the electrode holder and caused a short circuit.</i>	Take apart the electrode holder. Clean all parts with ultrapure water to remove corrosive chemicals. Dry all parts thoroughly. If the connection socket of the electrode was rinsed as well, allow the electrode holder to dry for several hours.
Double peak present.	<i>Organic constituents interfere with analysis.</i>	Carry out UV digestion or equivalent sample preparation.
	<i>The electrolyte solution is too old.</i>	Produce new electrolyte solution. Organic additives may only last 1 day or less.
	<i>A second substance is present at the same potential.</i>	Spike the sample with that substance and run the analysis again. If the second peak became higher, the second element is present. <ul style="list-style-type: none"> ▪ Try out different electrolytes (e.g. substances acting as complexing agents). ▪ Optimize the method parameters.

Problem	Cause	Remedy
	<i>Complexing (e.g. Cu with chloride).</i>	For Cu: Work without chloride in the electrolyte or massively increase the chloride concentration.
	<i>Formation of sparingly soluble compounds (e.g. Fe(III) in a neutral or alkaline solution).</i>	Optimize the measuring solution, e.g.: <ul style="list-style-type: none"> ▪ Use a different electrolyte for a different pH value. ▪ Add a complexing agent (such as citrate).
No spiking (all electrode types).	<i>The wrong standard solution has been used or the concentration is too low.</i>	<ul style="list-style-type: none"> ▪ Increase the volume of the standard addition. ▪ Use a higher concentration. ▪ Reduce the sample amount accordingly.
	<i>The concentration of the analyte is too large.</i>	Dilute the sample.
	<i>The potential of the reference electrode has shifted.</i>	Service the reference electrode.
	<i>Standard solutions that contain metal complexing agents need time to form the complex.</i>	No actions are necessary.
Outliers/signal jumps are present in the voltammogram.	<i>The MME pro or components of the MME pro have been damaged.</i>	<ul style="list-style-type: none"> ▪ Check the MME pro. ▪ If necessary, replace the capillary and needle (see the <i>Multi-Mode Electrode pro</i> document (8.110.8018XX)).
	<i>The potentiostat switches during measurement of the current measuring range.</i>	Check the current measuring ranges used during the measurement and select a higher value for the lowest range if necessary.
	<i>Air bubbles present in the reference electrode.</i>	Check the internal reference system and the bridge electrolyte vessel.
	<i>Gas bubbles present on the working electrode.</i>	Remove the gas bubbles and prevent them from forming again.
SPE cannot be inserted into electrode holder.	<i>The nut has been overtightened and closes off the slit in the silicone seal.</i>	Loosen the nut to open the slit in the silicone seal.
	<i>The supporting ring has rotated.</i>	Loosen the nut. Reposition the supporting ring. Align the slit in the supporting ring with the slit in the silicone seal.



Problem	Cause	Remedy
Sensor shows no measuring signal (with SPE) even though analyte is present.	<i>The electrode is installed upside down.</i>	Reinstall the electrode. This time, align the electrode with the symbol on the electrode shaft. Only in this position does the electrode have electrical contact to the connection socket.
	<i>The electrode was not pushed into the electrode shaft as far as it would go.</i>	Loosen the nut. Push the electrode into the electrode shaft as far as it will go. Then, tighten the nut again.
	<i>The SPE is defective.</i>	Replace the SPE.
Standard addition curves are not linear or poorly reproducible.	<i>The method parameters are set incorrectly.</i>	Check the method parameters (deposition potential, deposition time, etc.).
	<i>Pipetting has not been carried out correctly.</i>	<ul style="list-style-type: none"> ▪ Always add the standard solution through the pipetting opening. ▪ Instead of manual pipetting, automatically add standard solution using an 800 Dosino. ▪ Pipetting standard solutions has to be carried out by the same person or with the same instrument and the same pipette ▪ Use the pipetting unit correctly. ▪ If necessary, have the pipettes calibrated (GLP).
	<i>Organic constituents interfere with analysis.</i>	Carry out UV digestion or equivalent sample preparation.
	<i>The standard solutions are too old.</i>	Replace the standard solutions.
	<i>The additions are outside the linear working range of calibration.</i>	<ul style="list-style-type: none"> ▪ Decrease the volume or concentration of the standard solution. While doing so, it is important to note that each addition should increase the sample signal by 50–100%. ▪ Shorten the deposition time in the voltammetry command under Potentiostatic pretreatment. ▪ Carry out the determination using polarography at the DME instead of stripping voltammetry. ▪ Use less of the sample amount or dilute the sample.

Problem	Cause	Remedy
		<p>INFO: The linear working range of calibration depends heavily on the respective application. As a rule of thumb, the following linear working ranges can be assumed:</p> <ul style="list-style-type: none"> ▪ Polarography: 2-3 orders of magnitude ▪ ASV: 1-2 orders of magnitude ▪ AdSV, CSV: 1 order of magnitude
	<i>The stirrer does not work correctly.</i>	<ul style="list-style-type: none"> ▪ Ensure that the measuring head is attached correctly and locked in place. ▪ Ensure that the drive shaft is intact and fastened correctly. Replace the drive shaft if necessary. ▪ Ensure that the stirrer can turn easily. If necessary, service or replace the stirrer.
	<i>The measurement curves are generally not easily reproducible.</i>	See "Unstable or abnormally low base current" and "Curves have a large amount of noise".
The measuring head vibrates when operating the stirrer.	<i>The measuring head is not correctly locked in place on the instrument. This can hinder the connection between the drive disk on the instrument and the coupling on the measuring head.</i>	Remove the measuring head and put it back in place until it clearly clicks in place.
	<i>Only MME and SPE measuring head: The flexible shaft was not installed correctly.</i>	Install the flexible shaft according to (see chapter 3.2.1, page 33) or (see chapter 3.4.1, page 67). Make sure that the course of the flexible shaft is as straight as possible.
The peak is in the uppermost mA range (all electrode types).	<i>The concentration of the ion to be determined is too high.</i>	Reduce the sample volume, run the analysis again.
The peak is in the uppermost mA range (with HMDE).	<i>The deposition time (in the viva method, in the voltammetry command under Potentiostatic pretreatment) is too long.</i>	Reduce the deposition time.
	<i>The HMDE is not suitable for the specific use case.</i>	Instead of the HMDE, use a SMDE or DME.

Problem	Cause	Remedy
		Dry the electrode holder with a cloth.
	<i>The supporting ring is deformed.</i>	The supporting ring deforms with time. A deformed supporting ring does not distribute the pressure evenly. Replace the supporting ring as soon as it is deformed. Dry the electrode holder with a cloth.
Unstable or abnormally low base current in the pA range (all electrode types).	<i>The concentration of the electrolyte and the pH of the solution are insufficient.</i>	Check the concentration of the electrolyte and the pH of the solution.
	<i>The measuring parameters are not correct.</i>	Check the parameters on the Pretreatment and Sweep tabs of the voltammetry command in viva .
	<i>The ion concentration in the solution is too high.</i>	Dilute the electrolyte.
	<i>The ion concentration in the solution is too low.</i>	Use more concentrated electrolyte.
	<i>Oxygen is interfering with the measurement. The sample has not been purged sufficiently.</i>	We recommend purging with nitrogen for at least 5 min or approximately 10 min for alkaline solutions.
	<i>The reference electrode is not filled sufficiently (inside and outside).</i>	Top up the reference electrode (<i>see chapter 3.2.2.2, page 43</i>).
	<i>The reference electrode's diaphragm is partially or completely blocked (e.g. from precipitation caused by incompatible solutions like KCl as a bridge electrolyte and HClO₄ as an electrolyte in the measuring solution).</i>	Ensure the compatibility of the chemistry. Replace the bridge electrolyte if necessary (such as using a NaCl or KNO ₃ solution in place of KCl).
	<i>The electrolyte solution is too old.</i>	Produce new electrolyte solution. Organic additives may only last 1 day or less.



Problem	Cause	Remedy
Unstable or abnormally low base current in the pA range (with MME pro).	<i>The electrode drips continuously.</i>	<ul style="list-style-type: none"> ▪ Check the MME pro. ▪ Adjust the needle and capillary. ▪ If necessary, replace the capillary or needle (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>).
	<i>The tapping mechanism on the VA stand base is not functioning correctly.</i>	<ul style="list-style-type: none"> ▪ Check the positioning of the capillary in the MME pro. The capillary has to be centered in the retaining screw. ▪ The retaining screw is too loose or too tight: Use the wrench for the MME (6.1247.220) to tighten the retaining screw to the right torque.
	<i>The gas pressure is set incorrectly.</i>	Set the gas pressure (1–1.2 bar; 14.5–17.4 psi; 0.1–0.12 MPa).
	<i>The gas pressure is unstable.</i>	The gas pressure must hardly change during the measurement. This can only be ensured if a high-quality pressure relief valve is used and the tubing connection between the pressure relief and the instrument is not extended.
	<i>The concentration to be determined is substantially higher than assumed.</i>	<ul style="list-style-type: none"> ▪ Reduce the deposition time. ▪ If the application permits, change the electrode type (e.g. HMDE to SMDE or DME). ▪ Reduce the sample volume.
	<i>Dripping stops prematurely (only for HMDE).</i>	<ul style="list-style-type: none"> ▪ The stirrer hits the capillary: Check the position of the MME pro and the capillary. ▪ Nitrogen bubbles rise up when the Hg drips: Check the position of the gas inlet tubing and correct if necessary. ▪ Capillary defective: Replace the capillary (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>).
	<i>The drop size is not reproducible.</i>	<ul style="list-style-type: none"> ▪ The capillary and/or needle is not adjusted correctly: Adjust the needle and capillary (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>).

Problem	Cause	Remedy
		<ul style="list-style-type: none"> The capillary and/or needle is defective: Replace the capillary and needle. If necessary, clean the MME pro (see the <i>Multi-Mode Electrode pro document (8.110.8018XX)</i>). The tapping mechanism is not functioning correctly: Check the tapping of the drops.

6.1.3 884 Professional VA for CVS

Problem	Cause	Remedy
Conditioning takes a long time.	<i>The reference electrode has not yet reached equilibrium.</i>	After maintenance of the reference electrode, wait for at least 20 min before starting a measurement.
	<i>The working electrode is contaminated.</i>	Condition the working electrode in pure VMS.
	<i>The electrode tip of the working electrode has been in use for a long period.</i>	<ul style="list-style-type: none"> Immerse the electrode tip in $c(\text{NaOH}) = 0.5 \text{ mol/L}$ for approx. 10 min and then thoroughly rinse with distilled water. Replace the electrode tip if necessary.
	<i>VMS is contaminated.</i>	Check the purity of the reagents (only reagents of sufficient purity, i.e. > 99%, should be used).
	<i>The water quality is poor.</i>	Use distilled water, type-II grade (ASTM D1193-91) or higher.
	<i>The measuring solution has been contaminated as a result of diffusion.</i>	No infeed tubing other than the 4-way micro dosing tip (6.1824.000) may be immersed in the measuring solution.
The electrode tip of the working electrode and/or the auxiliary electrode shows copper deposits.	<i>An incorrect potential has been applied because the reference electrode is defective.</i>	<ul style="list-style-type: none"> Check the reference electrode; perform maintenance procedure in accordance with the electrode leaflet, if necessary. Dip the electrode tip of the working electrode and/or the auxiliary electrode into concentrated nitric acid for 1 to 2 seconds and then thoroughly rinse with distilled water.



Problem	Cause	Remedy
	<i>An incorrect potential was applied because the reference electrode is not connected.</i>	<ul style="list-style-type: none"> Check the electrode connectors. Dip the electrode tip of the working electrode and/or the auxiliary electrode into concentrated nitric acid for 1 to 2 seconds and then thoroughly rinse with distilled water.
	<i>An incorrect potential was applied because the measuring vessel contains too little measuring solution.</i>	<ul style="list-style-type: none"> All 3 electrodes must be immersed in the measuring solution. Dip the electrode tip of the working electrode and/or the auxiliary electrode into concentrated nitric acid for 1 to 2 seconds and then thoroughly rinse with distilled water.
The measurement curves are noisy.	<i>Contact problem at the driving axle (6.1204.510 or 6.1204.520).</i>	<ul style="list-style-type: none"> Remove the abrasion residue from the driving axle. Replace the driving axle.
The measuring signal for Cu VMS fluctuates.	<i>The ambient and/or solution temperature is not constant.</i>	Keep the ambient and solution temperature stable during measurements (± 4 °C).
	<i>The reference potential drifts off.</i>	Perform the maintenance procedure for the reference electrode in accordance with the electrode leaflet. However, for CVS analyses, replace the reference electrolyte every other day and the bridge electrolyte every day. After replacing the reference electrolyte, wait at least 20 minutes (preferably 1–2 h) until the potential has reached equilibrium.
	<i>The measuring vessel and the electrodes have been contaminated with organic additives.</i>	Thoroughly rinse the measuring vessel and the electrodes and use fresh VMS.
The signal does not decrease in spite of suppressor addition.	<i>No chloride is contained in the Cu VMS.</i>	Check the preparation of the Cu VMS and modify it if required.
	<i>The wrong dosing unit is being used for the addition of standard solution or the dosing unit contains the wrong solution.</i>	Check the automatic solution addition.

Problem	Cause	Remedy
	<i>The concentration of the standard solution or the sample is too low.</i>	Add a larger volume or use the RC calibration technique instead of DT.

7 Appendix

7.1 Tubing lengths in the measuring head arm

The following list provides information about the lengths and diameters of the pieces of tubing used in the measuring head arm between the connector plate and the tubing connector. You will need this information for setting the parameters of the dosing units in **viva** (e.g. for the function **Prepare**).

Connection between connector plate (1-4) and tubing connector of the measuring head arm (see chapter 2.3.3, page 18)	Article number	Tubing length in mm	Diameter in mm
Connector 1	Connector 1	6.1805.550	250	2.00
Connector 2	Connector 2	6.1805.550	250	2.00
Connector 3	Connector 3	6.1805.550	250	2.00
Connector SMP	Connector SMP	6.1831.020	220	0.75
Connector WASTE	Connector WASTE	6.1805.050 and 6.1805.540	210 and 80	2.00
Connector OUT	Connector OUT	6.1805.550	250	2.00

7.2 "Status" LED – Various instrument statuses

The "Status" LED on the front of the instrument indicates 3 different statuses:

Continuously on

The instrument is ready for operation.

Blinking regularly

The instrument is operating.

Blinking pattern
"LED on a long time - off a short time - on a long time - off a short time..."



A standby potential is being applied to the electrodes. Do not remove the measuring head or the electrode cables in this instrument status.

8 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. **2.884.XX10**) 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.

