RRDE Cell

User Manual

1.2 / April, 2025

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1.0

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Although all the information given in this documentation has been checked with great care, errors cannot be entirely excluded. Should you notice any mistakes please send us your comments using the address given above or at autolab@metrohm.com.

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1 Unpacking instructions

Unpack carefully the cell and the accessories supplied with it and make sure all parts are present.

All details concerning the scope of delivery of the Rotating ring-disk electrode (RRDE) cell are presented in the dedicated chapter, later in this document *(see "Scope of delivery", chapter 3, page 3)*. For the detailed parts description, please see *Figure 2* and *Figure 3*

Carefully inspect all parts for damage. If damage is observed on any parts, please contact Metrohm Autolab for a replacement.

WARNING

Broken glass

Never use damaged glass parts! It can cause injury.

2 Warranty

The Autolab *RRDE Cell* is protected by an initial factory warranty covering any failure or damage of any component supplied with the cell. **The warranty expires after the cell is unpacked, inspected for damage and used for the first time**. When unpacking the cell, carefully inspect all parts and, if necessary, report any damage or failure immediately.

3 Scope of delivery

Based on the parts included in the package, the Autolab RRDE cell is available in two configurations:

- **Autolab RRDE cell only** (RRDE.CELL.ONLY.S)
- **Autolab RRDE cell complete** (RRDE.CELL.CPL.S)

The **Autolab RRDE cell only** (RRDE.CELL.ONLY.S) includes a 300 mL glass vessel [1] with a thermostatic jacket for temperature control together with the lid consisting of an anodized aluminium clamp [3] and a PTFE insert [2] which can be easily removed for cleaning purposes. The lid is clamped on the glass cell by using a removable nylon ring [4] in the exterior of the cell. A removable PTFE coated silicon O-ring is used to assure a tight fit of the lid on the glass cell. The hose connectors [5] for connecting the cell to the thermostating water bath are also included.

The **Autolab RRDE cell complete** (RRDE.CELL.CPL.S) includes all parts of the **Autolab RRDE cell only** package and, additionally, a gas inlet for purging [7], two glass stoppers [8], an Ag/AgCl reference electrode [9], a Pt sheet counter electrode [10], a glass thermometer [11] with adapter [12], two intermediate SGJ (standard ground joint) sleeves [14] and a base with support rod [13] which can be used to fix the cell during the experiment.

Detailed description of each individual part is presented later in this document

The scope of delivery of the **Autolab RRDE cell only** is presented in *Figure 2*.

The scope of delivery of the **Autolab RRDE cell complete** is presented in *Figure 3*.

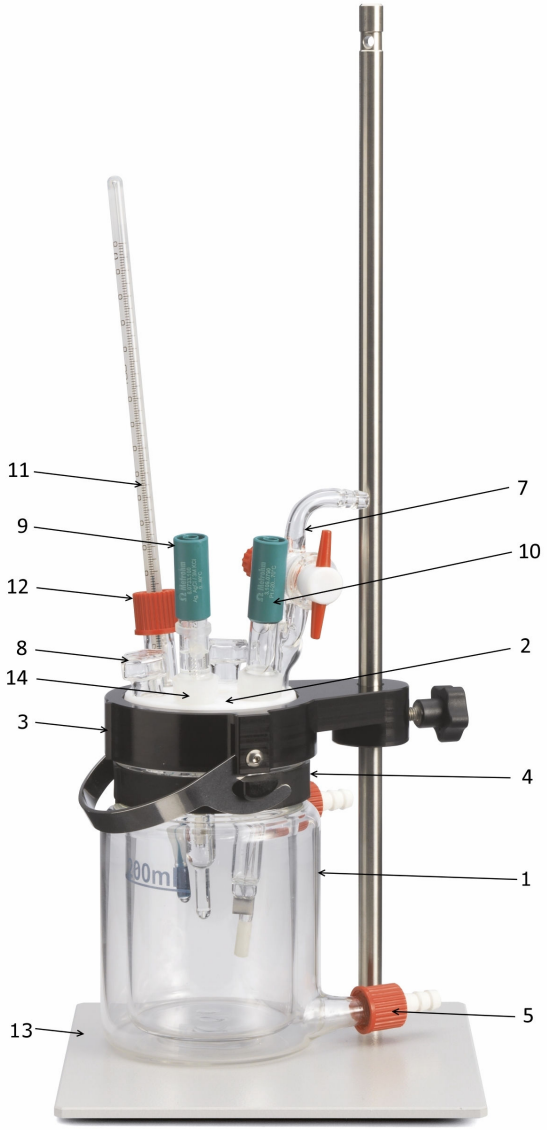

Figure 1 Overview of the Autolab RRDE cell complete

1 **Glass vessel with thermostatic jacket, 300 ml** Item code: RRDE.VESSEL, Qty. 1	**2** **Teflon lid for the RRDE cell** Item code: RRDE.CAP, Qty. 1
3 **Aluminum clamp for the RRDE cell** Item code: RRDE.CLAMP, Qty. 1	**4** **Nylon ring for the RRDE cell** Item code: RRDE.RING.NYLON, Qty. 1
5 **Hose connector for the RRDE cell** Item code: RRDE.HOSE.CONN, Qty. 2	**6** **Teflex FEP/SIL 67x4 O-ring for the RRDE cell** Item code: RRDE.ORING.SIL, Qty. 1

7	**Gas inlet with frit (PTFE stopcock) for the RRDE cell** Item code: GAS.INLET.FRIT, Qty. 1	**8**	**Glass stopper for RRDE cell** Item code: RRDE.STOPPER, Qty. 2
9	**LL Ag/AgCl reference electrode** Item code: 6.0733.100, Qty. 1	**10**	**Pt sheet electrode** Item code: PT.SHEET.S, Qty. 1
11	**Thermometer** Item code: CORR.THERM, Qty. 1	**12**	**Thermometer adapter** Item code: RRDE.THERM.ADAPT, Qty. 1
13	**Base with support rod** Item code: 6.2026.010, Qty. 1	**14**	**Intermediate SGJ sleeve** Item code: 6.2727.010, Qty. 2

The list of items included with Autolab **RRDE cell only** is presented in *Figure 2* below:

Figure 2 Scope of delivery for the Autolab RRDE cell only

1	**Glass vessel with thermostatic jacket, 300 ml** Item code: RRDE.VESSEL, Qty. 1	**2**	**Teflon lid for the RRDE cell** Item code: RRDE.CAP, Qty. 1
3	**Aluminum clamp for the RRDE cell** Item code: RRDE.CLAMP, Qty. 1	**4**	**Nylon ring for the RRDE cell** Item code: RRDE.RING.NYLON, Qty. 1
5	**Hose connector for the RRDE cell** Item code: RRDE.HOSE.CONN, Qty. 2	**6**	**Teflex FEP/SIL 67x4 O-ring for the RRDE cell** Item code: RRDE.ORING.SIL, Qty. 1

The list of items included with Autolab **RRDE cell complete** is presented in *Figure 3* below:

Figure 3 Scope of delivery for the Autolab RRDE cell complete

1	**Glass vessel with thermostatic jacket, 300 ml** Item code: RRDE.VESSEL, Qty. 1	**2**	**Teflon lid for the RRDE cell** Item code: RRDE.CAP, Qty. 1
3	**Aluminum clamp for the RRDE cell** Item code: RRDE.CLAMP, Qty. 1	**4**	**Nylon ring for the RRDE cell** Item code: RRDE.RING.NYLON, Qty. 1
5	**Hose connector for the RRDE cell** Item code: RRDE.HOSE.CONN, Qty. 2	**6**	**Teflex FEP/SIL 67x4 O-ring for the RRDE cell** Item code: RRDE.ORING.SIL, Qty. 1
7	**Gas inlet with frit (PTFE stopcock) for the RRDE cell** Item code: GAS.INLET.FRIT, Qty. 1	**8**	**Glass stopper for RRDE cell** Item code: RRDE.STOPPER, Qty. 2
9	**LL Ag/AgCl reference electrode** Item code: 6.0733.100, Qty. 1	**10**	**Pt sheet electrode** Item code: PT.SHEET.S, Qty. 1
11	**Thermometer** Item code: CORR.THERM, Qty. 1	**12**	**Thermometer adapter** Item code: RRDE.THERM.ADAPT, Qty. 1
13	**Base with support rod** Item code: 6.2026.010, Qty. 1	**14**	**Intermediate SGJ sleeve** Item code: 6.2727.010, Qty. 2

3.1 Glass cell

The jacketed glass cell vessel (RRDE.VESSEL) has a volume of 300 mL. There is an inlet and an outlet with hose connectors (RRDE.HOSE.CONN) present for circulation of water or other heating or cooling liquids. The two hose connectors are identical but, for the most efficient temperature control, it is recommended to have the inlet at the bottom and the outlet at the upper part of the cell. The **200 ml** marking on the cell indicates (approximately) the minimum level of the electrolyte necessary for an experiment performed in combination with the Autolab R(R)DE.

Figure 4 Glass cell vessel and hoses for the thermostatic jacket

WARNING

Broken glass

The Autolab RRDE Cell is not designed to withstand any pressure ≥0.03 Bar in the water jacket or in the main cell compartment. If the preassure will exceed 0.03 Bar, the glass cell can break.

3.2 Lid

The lid consists of the following parts:

- one removable PTFE insert (RRDE.CAP)
- one anodized aluminium clamp (RRDE.CLAMP)
- one nylon ring (RRDE.RING.NYL) used on the glass cell to clamp the lid onto the cell
- one Teflex (PTFE coated silicon) O-ring (RRDE.ORING.SIL) which ensuers the air tightness of the lid mounted on the cell

Figure 5 Lid consisting of: aluminum clamp, o-ring, PTFE insert and Nylon ring

The PTFE removable insert can be cleaned in very aggressive chemical media (e.g. piranha solution) and is designed with an external rim which does not allow the electrolyte and the interior of the cell to come in contact with any external parts of the cell. In this way, the highest possible cleanliness can be achieved.

The PTFE removable insert has 7 standard SGJ 14/15 inlets which will hold directly and conveniently the Autolab R(R)DE rotator (in the centre), Metrohm reference and counter electrodes, the thermometer with the adapter, the gas inlet and any other additional accessories which might be

needed for the measurement (e.g. pH electrode, temperature probe etc., not included).

The lid of the Autolab RRDE cell is also compatible with the Metrohm titration vessels. Therefore, the Metrohm titration vessels (6.1415.xxx or 6.1418.xxx) can be also used for other cell volumes or for applications when thermostatic jacket is not needed.

3.3 Reference electrode

The Metrohm Ag/AgCl reference electrode (6.0733.100) is filled with 3M KCl solution. Please make sure that the electrode contains enough solution with the correct concentration during the measurement.

3.4 Counter electrode

The Metrohm Pt sheet (PT.SHEET.S) counter electrode is recommended to be used with the RRDE cell.

Figure 6 Reference and counter electrodes together with SGJ 14/15 intermediate sleeves

For assuring a perfect laminar flow in the electrolyte during electrochemical hydrodynamic measurements, it is recommended to keep the reference and the counter electrode above or at the same level with the surface of the rotating electrode. If necessary, the intermediate SGJ sleeves (6.2727.010) can be used to adjust the height of the reference and counter electrodes.

3.5 Thermometer

In the PTFE insert of the lid, one position is available for a glass thermometer (CORR.THERM) by using the SGJ 14/15 thermometer adapter (RRDE.THERM.ADAPT).

Figure 7 Thermometer with adapter

3.6 Gas inlet

A gas inlet with frit and PTFE stopcock (GAS.INLET.FRIT) is part of the complete RRDE cell. The ground joint has the standard (SGJ) 14/15 size.

During the purging process, the gas is dispersed through the frit creating microbubbles which assure the most efficient purging of the electrolyte.

The valve can be used to switch between purging through the electrolyte and covering the liquid with an inert gas blanket.

Figure 8 Gas inlet with frit and PTFE stopcock

During purging, the cell should not have all openings completely closed so that an overpressure will not be created in the cell.

WARNING

If the gas inlet including the PTFE stopcock needs to be cleaned in chemically aggressive media, make sure the red plastic parts and the Viton O-ring are first removed from the stopcock.

3.7 Stoppers

For experiments which require controlled gas atmosphere, the glass stoppers can be used (RRDE.STOPPER) to close any unused inlets on the lid. The glass stoppers are SGJ 14/15 size.

Figure 9 Glass stoppers

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