

# Usage of the rhd Cooling Box in combination with the Microcell HC Setup

Regarding the preparation of the Microcell HC Setup, we refer to the Microcell HC User Manual (version 2.1 or higher). Upon delivery, all recommended settings are made except for the cables at the rear side of the box which have to be carefully pulled outside the protection cage.

## Introduction

In general, the Microcell HC setup allows for electrochemical measurements with temperature control. Since the working principle is based on a modular concept, different measuring cells can be combined with the temperature control unit enabling the characterization of liquid, gel-like, polymeric and solid samples.

However, when the sample has to be cooled down below 0 °C, especially down to temperatures lower than -20 °C, it is not recommended to carry out these experiments under condensing conditions. Thus, if there is no possibility of performing the experiment under non-condensing conditions, e.g. inside a glove box, we recommend the usage of the rhd Cooling Box for measurements at low temperatures.

## The rhd Cooling Box

### Technical Specifications of rhd Cooling Box

» Ambient temperature:	16 ... 32 °C
» Electric connection:	230 VAC/50 Hz/76 W
» Power converter to 110 V upon request	
» Energy consumption:	0,6 kWh/d
» Refrigerant:	R600a (18 g)
» Weight	18 kg
» Size (height x width x depth):	51 x 43 x 48 cm



#### **Please note:**

The appliance contains in the refrigerant circuit the refrigerant isobutene (R600a), a environmentally compatible natural gas that is flammable. While transporting and installing the appliance ensure that no parts of the refrigerant circuit are damaged.

Procedure if the refrigerant circuit is damaged: Disconnect the device from the power supply and contact the technical support.

Avoid open fire and ignition sources at all costs. Ensure that the room in which the appliance is located is well ventilated.

The rhd Cooling Box has been equipped with a professional temperature controller (ENDA ETC1311 digital thermostat, SURAN Industrieelektronik) which allows for choosing a tempera-

ture set point ranging from 0 °C to 20 °C.



**Please note:**

Do not use the device in locations subject to corrosive and flammable gases.

For cleaning the device, solvents (thinner, benzene, acid etc.) or corrosive materials must not be used.

Furthermore, four BNC cables for connecting the electrodes and one cable for connecting the Microcell HC base with the rhd instruments temperature controller have been installed. To guarantee for a fixed position of the Microcell HC setup, a baseplate has been designed allowing for two different positions of the setup during the operation.

## **Installation of the rhd Cooling Box**



**Please note:**

The rhd Cooling Box is suitable for measurements using the Microcell HC setup at low temperatures, especially at temperatures lower than 0 °C. For series measurements at temperatures > 0 °C only, we recommend to use the Microcell HC setup outside the rhd Cooling Box.

In case of any other unsupported use of the rhd Cooling Box as well as any mechanical and/or electronic modifications of the rhd Cooling Box made by non-authorized staff the guarantee will be expired and liability of rhd instruments GmbH & Co. KG will be excluded.

## **Positioning**

The rhd Cooling Box should be located in a well-ventilated and dry room. Sufficient air circulation must be guaranteed. Regarding the back side and the right as well as left side of the box, position it at least 200 mm away from the wall, and furthermore a space of 300 mm must be left at the top. If you wish to place the box on a carpet, ensure that you use a solid and smooth base.

The rhd Cooling Box must not be exposed to direct solar radiation.

The rhd Cooling Box must not stand on heating elements, next to a stove or other heat sources (except the rhd instruments temperature controller).

The rhd Cooling Box must be positioned so that the mains plug is accessible.

The rhd Cooling Box may only stand in a location where the ambient temperature corresponds to the climate classification for which the box is designed (in this case: 16 to 32 °C).

## Getting started



### Please note:

It is imperative that the box be earthed according to the directions. For this purpose the plug of the connecting cable is provided with the appropriate contact.

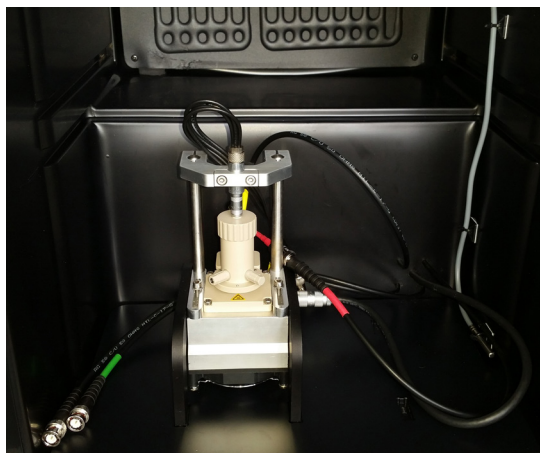
Call a specialist electrician if the plug does not fit into the socket. Do not try to force the plug into the socket.

If you disconnect the box from the mains supply, or if a power cut occurs: wait for 5 minutes before you restart the box.

High room temperatures (such as e.g. on hot summer days) and a cold temperature setting can lead to continuous refrigerator operation. The reason for this is that the compressor has to run continuously in order to maintain the low temperature in the box. The box is not able to defrost automatically because this is only possible when the compressor is not running. Therefore, a thick layer of frost or ice may form on the rear interior wall.

For carrying out experiments under temperature control using the Microcell HC + rhd Cooling Box unit, please follow the instructions given below:

- » Load the measuring cell with your sample and connect the measuring cell to the Microcell HC base.
- » Transfer the prepared measuring setup into the rhd Cooling Box. Connect the BNC cables to the electrodes (see Microcell HC User Manual version 2.1 or higher). Connect the cell cable to the rhd temperature controller placed outside the rhd Cooling Box. Check if the sample temperature is indicated at the Eurotherm display.
- » Set the temperature of the rhd Cooling Box to 2 °C by pressing the buttons at the front panel (see ENDA ETC1311 digital thermostat manual). Close the door of the rhd cooling box and wait until the temperature set point has been reached.
- » If a series of measurements should be performed, we recommend a steady operation of the cooling box.
- » If very low sample temperatures should be reached, we recommend to let the cell as well as the box cool down for at least 1 hour before the measurement starts.
- » Start the measurement.



## Long-time measurements at low temperatures: Using a further stage

For several studies, it might be necessary to hold your sample and thus also the measuring cell at temperatures lower than  $-30\text{ }^{\circ}\text{C}$  for a time interval longer than 30 minutes. If you use a rhd Cooling Box, you will notice that within this time interval the temperature of the rhd Cooling Box will increase to a maximum value of  $15\text{ }^{\circ}\text{C}$  due to the heat dissipation at the hot side of the Peltier element. Since the maximum temperature difference  $\Delta T$  between the cold and hot side of this high performance Peltier element is  $60\text{ }^{\circ}\text{C}$ , the lowest reachable temperature is  $-45\text{ }^{\circ}\text{C}$ . However,  $\Delta T$  also depends on the actual temperature of the Peltier element which is the reason why only values close to  $-35\text{ }^{\circ}\text{C}$  can be reached in this case. To overcome this obstacle, this chapter shows you how to remodel the Cooling Box using the additional stage to be able to work at temperatures even lower than  $-40\text{ }^{\circ}\text{C}$  for longer time spans.



### Please note:

The additional stage comes with a double-sided tape fixed at the bottom of the stage. If you do not want to fix the stage to the box, please do not remove the protective sheet.

Please follow the instructions given below for performing measurements using the rhd Cooling Box equipped with an additional stage:

- » Turn the stage and make sure that the protective sheet of the tape points to the bottom of the Cooling Box.
- » Let the platform slowly slip into the guiding rail of the Cooling Box while pushing it slightly against the upper edge of the guiding rail.
- » Feed the cables through the recess of the stage.
- » Prepare the measuring cell and the Microcell HC cell stand outside the rhd Cooling Box.
- » Transfer the cell stand equipped with the measuring cell into the Cooling Box. Connect the BNC cables to the electrodes (see Microcell HC User Manual version 2.1 or higher). Connect the cell cable to the rhd temperature controller placed outside the rhd Cooling Box. Check if the sample temperature is indicated at the Eurotherm display.



- » Set the temperature of the rhd Cooling Box to  $2\text{ }^{\circ}\text{C}$  by pressing the buttons at the front panel (see ENDA ETC1311 digital thermostat manual). Close the door of the rhd cooling box and wait until the temperature set point has been reached.
- » If a series of measurements should be performed, we recommend a steady operation of the cooling box.

- » If very low sample temperatures should be reached, we recommend to let the cell as well as the box cool down for at least 1 hour before the measurement starts.
- » Start the measurement.



**Please note:**

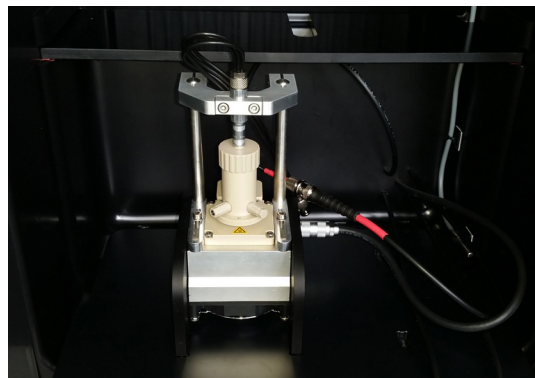
Ideally before carrying out the first measurement, let the cell stand be cooled down inside the rhd Cooling Box for at least one hour.

Lower temperatures can now be reached over a longer time span since the setup is placed closer to the evaporator and the heat produced by the Peltier element can be deduced more effectively.



**Please note:**

If you should decide to fix the stage by removing the protective sheet from the tape, you could still place the Microcell HC cell stand at the baseplate. However for doing so, we recommend to move the baseplate a little bit to the front. Place the Microcell HC setup in the cavities and push the baseplate together with the setup to its original position, see picture below.



## Contact and Technical Support

For any questions with regard to our products, orders, or request for repairs please contact rhd instruments:

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# EU-Konformitätserklärung

## EU Declaration of conformity



Regelbarer Kälteschrank „rhd Cooling Box“  
Adjustable low-temperature cabinet „rhd  
Cooling Box“

Wir, die rhd instruments GmbH & Co. KG,

We, rhd instruments GmbH & Co. KG,

**rhd instruments GmbH & Co. KG**

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**64293 Darmstadt**

**Germany**

erklären, dass der regelbare Kälteschrank rhd Cooling Box in Konzeption und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den grundlegenden Anforderungen der zutreffenden, aufgeführten EU-Richtlinien entspricht. Bei einer mit uns nicht abgestimmten Änderung an dem Gerät verliert diese Erklärung ihre Gültigkeit.

hereby declare, that the adjustable low-temperature cabinet rhd Cooling Box is in compliance with the basic requirements of all applicable EU-directives stated below with regard to design, type of model sold and manufactured by us. This certificate will be invalid if the product is modified without the prior written consent and agreement of the manufacturer.

Niederspannungsrichtlinie 2014/35/EU / Low-Voltage Directive 2014/35/EU

Angewandte (harmonisierte) Normen / (Harmonized) Standards applied:

DIN EN 61010-1: Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte Teil 1: Allgemeine Anforderungen (IEC 61010-1:2010 + Cor.:2011)

Marburg, 01. April 2017

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