

# User Manual

Release 2.5

## **PAT-Cell**

Electrochemical test cell



The information in this manual has been carefully checked and believed to be accurate; however, no responsibility is assumed for inaccuracies.

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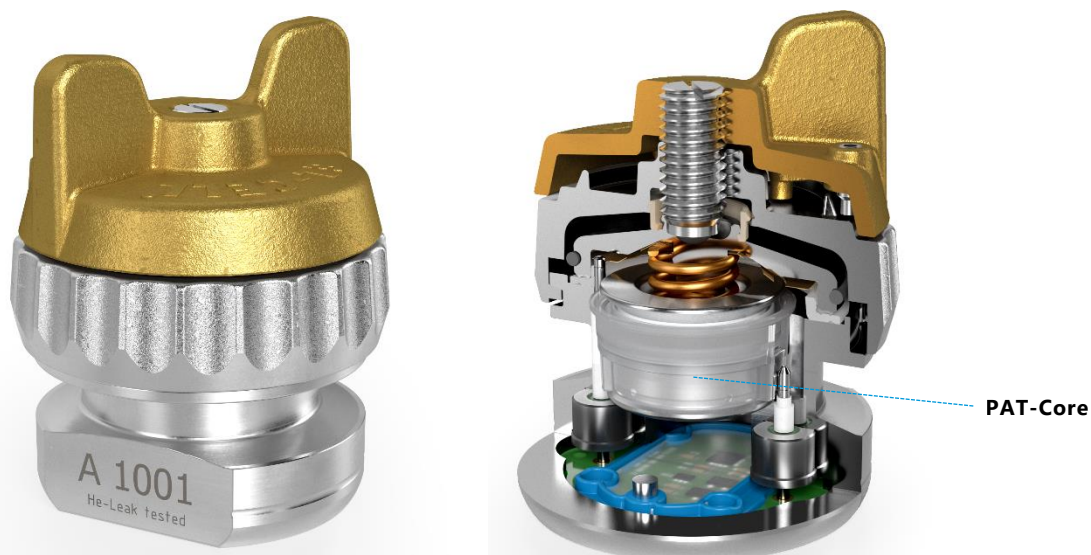
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## 1 Product description

The PAT-Cell is a standard test cell for two- and three-electrode testing of battery materials by using the PAT-Core. For connection to a potentiostat or battery tester, the PAT-Cell must be inserted into a PAT-Stand or PAT-Tester. It has no sockets for direct cable connections.



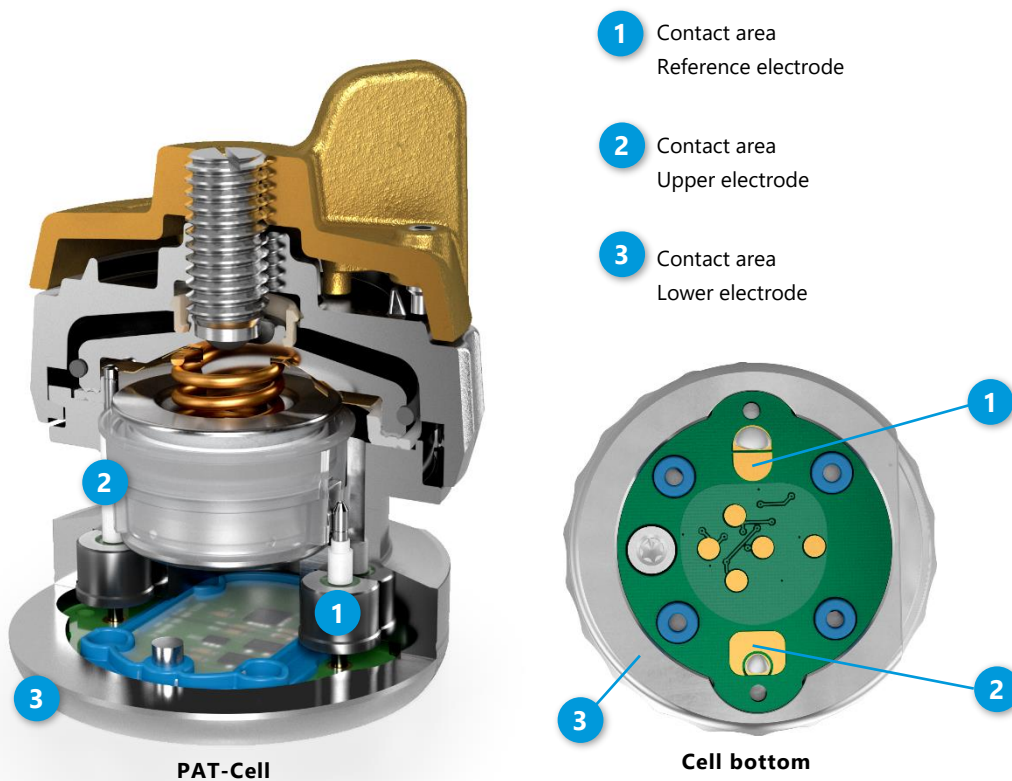
## 2 Features

- Enables long-term stable 2- and 3-electrode testing with the PAT-Core
- Can be used with all the different versions of the PAT-Core
- Compatible with all common aprotic, aqueous and highly corrosive electrolytes
- Electrode feedthroughs with glass-to-metal seals for improved temperature resistance
- Integrated electronic cell ID (PAT-Button) for automatic cell identification
- Compatible with metal seal lid for using aluminum lid seal
- Helium leak tight
- Easy and fast assembly and filling with electrolyte

### 3 Working principle of the PAT-Cell

The PAT-Cell is a leadless test cell. The two or three electrodes of the inside PAT-Core can only be accessed through the contact areas at the cell bottom. The PAT-Cell may be inserted into any socket of a PAT docking station (PAT-Stand and PAT-Chamber) and PAT battery tester.

The inside PAT-Core of the PAT-Cell is an unsealed container for the electrodes, the separator and the electrolyte. The cell becomes hermetically tight only after encasing the PAT-Core inside the outside housing consisting of the cell base and cell lid. A compression spring mounted to the cell lid serves to define the mechanical pressure onto the cell stack.

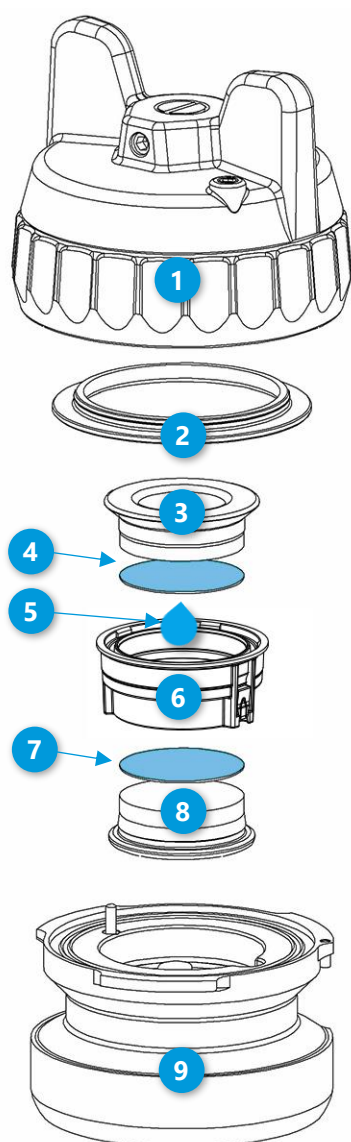


## 4 Safety precautions

Use proper safety precautions when using hazardous electrode materials and electrolytes. Wear protective glasses and gloves to protect you against electrolyte that may accidentally spill out during filling and disassembly. Upon cell disassembly, dispose all materials properly.

## 5 Cell Assembly

This section describes how the PAT-Cell has to be assembled in order to conduct proper battery tests. Please note that the assembly has to take place under the protective atmosphere in a glove box.



**1.** Put the **insulation sleeve (6)** onto the worktop with the smaller side pointing upwards.

**2.** Insert the **lower electrode (7)** into the sleeve with the active layer facing downwards.

**3.** Attach the **lower plunger (8)**. The lower plunger is available in different gap sizes in order to account for the thickness of the lower electrode and the separator used.

**4.** Turn the assembly upside down.

**5.** Align the contact spring of the sleeve with the horizontal contact pin inside the **cell base (9)**. Then insert the assembly into the cell base.

**6.** Evenly dispense approx. 100  $\mu$ L of **electrolyte (5)** on top of the separator with a pipette. Note: The optimum amount of electrolyte will depend on the thickness and porosity of the separator and the electrodes used.

**7.** Insert the **upper electrode (4)** into the insulation sleeve with the active layer facing downwards.

**8.** Attach the upper plunger (3).

**9.** Attach the **screw cap (1)** to the cell base with the wing nut fully released.

**10.** Tighten the wing nut clockwise in order to seal the cell.

**11.** Attach the cell into a free socket of a PAT docking station or PAT-Tester.

## 6 Disassembly and Cleaning

After disassembly, dispose all single-use components and electrodes properly. If the cell base has got contaminated with electrolyte, clean it with plenty of water and dry with compressed air. Use less electrolyte for subsequent tests. Plungers made of stainless steel have to be cleaned with plenty of water. If necessary, remove persistent dirt with aqueous nitric acid (20%, 2 hours at room temperature). All other cell components are for immediate re-use without cleaning.

### Notes:

- Protect yourself against chemical hazards. Electrolyte may spill out during cleaning. Electrode materials and electrolyte may react with ambient atmosphere or solvents used for cleaning. Wear appropriate protection equipment, goggles and gloves.
- Clean all cell parts right after disassembly. Leaving cell parts in contact with ambient atmosphere while still being wetted with electrolyte may result in severe corrosion.

The electronic components at the bottom of the cell base (PAT-Button) must not come into contact with liquid.

## 7 Unpacking

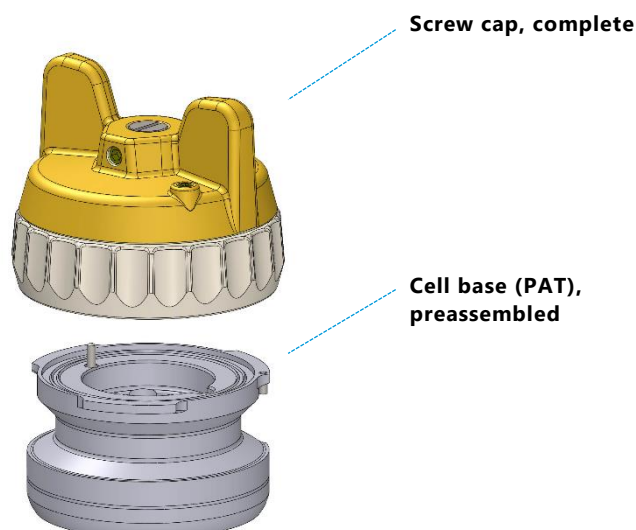
Check the contents of the package against the list given below to verify that you have received all of the required components. Contact EL-CELL, if anything is missing or damaged.

**Note:** Damaged shipments must remain within the original packaging for freight company inspection.

### List of components:

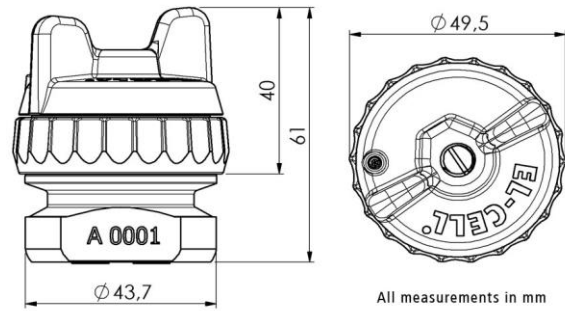
#### PAT-Cell test cell without PAT-Core

**Note:** The components of the PAT-Core (insulation sleeves and plungers) must be purchased separately.



## 8 Technical data

- Diameter: **49.5 mm**
- Height: **61 mm**
- Weight: **0.4 kg**
- Electrode diameter: **18 mm**
- Temperature resistance **-40 to +80 °C**

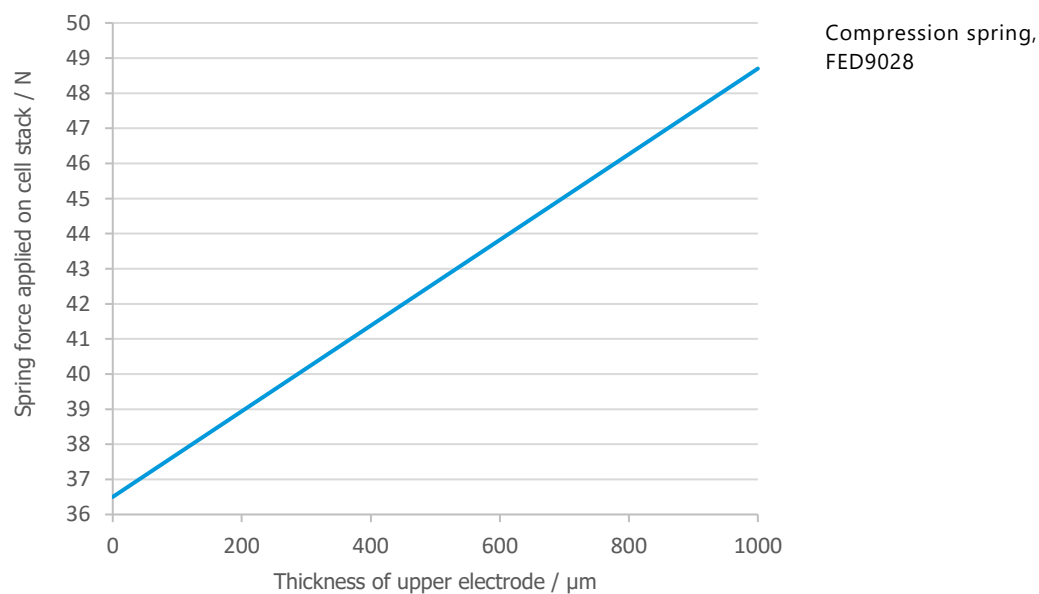


### 8.1 Compatible PAT Docking Stations

The PAT-Cell can be used with all PAT docking stations and PAT-Testers

- PAT-Clamp-1
- PAT-Stand-1
- PAT-Stand-4
- PAT-Stand-16
- PAT-Chamber-16
- PAT-Tester-x
- PAT-Tester-i-16

### 8.2 Spring force in relation to the thickness of the upper electrode:





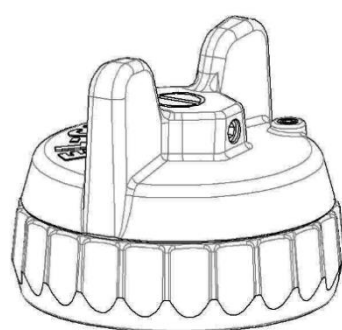
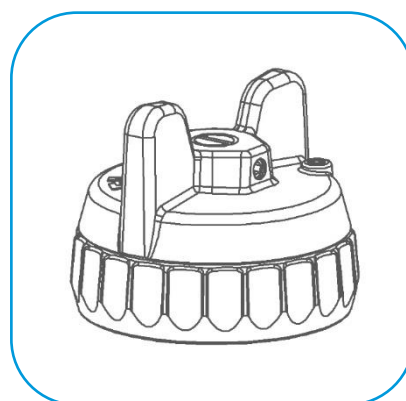
## 9 Consumables

### Seals (single-use):

- Sealing ring, PE (lid, 10 pcs) [ECC1-00-0232-A/X](#)
- Sealing ring, PTFE (lid, 10 pcs) [ECC1-00-0232-B/X](#)
- Sealing ring, PEEK (lid, 10 pcs) [ECC1-00-0232-E/X](#)

## 10 Spare parts

### Components screw cap

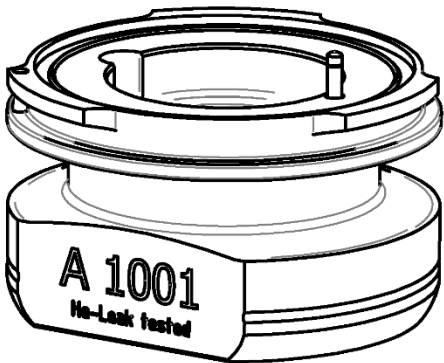


Disc spring  
[ECC1-00-0233-A](#)

Compression Spring  
[FED9028](#)

Sealing ring  
[ECC1-00-0232-A](#)

Components cell base



Cell base II GTMS (PAT-Cell), assy  
ECC1-00-0260-E

! Legacy version

Cell base (PAT)  
ECC1-00-0234-A

Button holder  
ECC1-00-0247-B

Shaft ring  
FED9029

Button (PAT)  
ECC1-00-0253-A

Screw  
N\_965

## 11 Technical support

Technical support for this product is exclusively provided by EL-Cell GmbH.

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## 12 Warranty

For a period of one year from the date of shipment, EL-Cell GmbH (hereinafter Seller) warrants the goods to be free from defect in material and workmanship to the original purchaser. During the warranty period, Seller agrees to repair or replace defective and/or nonconforming goods or parts without charge for material or labor, or, at the Seller's option, demand return of the goods and tender repayment of the price. Buyer's exclusive remedy is repair or replacement of defective and nonconforming goods, or, at Seller's option, the repayment of the price.

Seller excludes and disclaims any liability for lost profits, personal injury, interruption of service, or for consequential incidental or special damages arising out of, resulting from, or relating in any manner to these goods.

This Limited Warranty does not cover defects, damage, or nonconformity resulting from abuse, misuse, neglect, lack of reasonable care, modification, or the attachment of improper devices to the goods. This Limited Warranty does not cover expendable items. This warranty is void when repairs are performed by a non-authorized person or service center. At Seller's option, repairs or replacements will be made on site or at the factory. If repairs or replacements are to be made at the factory, Buyer shall return the goods prepaid and bear all the risks of loss until delivered to the factory. If Seller returns the goods, they will be delivered prepaid and Seller will bear all risks of loss until delivery to Buyer. Buyer and Seller agree that this Limited Warranty shall be governed by and construed in accordance with the laws of Germany.

The warranties contained in this agreement are in lieu of all other warranties expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

This Limited Warranty supersedes all prior proposals or representations oral or written and constitutes the entire understanding regarding the warranties made by Seller to Buyer. This Limited Warranty may not be expanded or modified except in writing signed by the parties hereto.