EL-CELL®
electrochemical test equipment

User Manual

Release 2.81

PAT-Cell

Electrochemical test cell



© 2026 EL-CELL GmbH

Disclaimer

EL-Cell GmbH makes no assurances or warranties with respect to this manual and, to the extent permitted by law, limits its liability for violation of any implied warranty to the substitution of this manual for another. In addition, EL-Cell GmbH reserves the right to revise this publication at any time without notice to anyone.

The information provided in this documentation includes general descriptions and/or technical characteristics regarding the performance of the equipment described herein. This documentation cannot serve as a proper evaluation of the suitability or reliability of the equipment for any specific application by any user and should not be relied upon as a substitute for such evaluation. It is the responsibility of each such user or installer to conduct an appropriate and complete risk assessment, evaluation and testing of the equipment with respect to their specific application. EL-Cell GmbH cannot be held responsible or liable for any misuse of the information contained herein.

All relevant state, regional and local safety regulations must always be complied with when installing and using this device. For safety reasons and to ensure compliance with the documented system data, only the manufacturer is authorized to perform repairs on components.

Disregarding this information may result in injury or damage to the equipment.

All rights reserved. No part of this publication may be reproduced, processed, or transmitted in any form, including photocopying, recording, or any other electronic or mechanical process, without the written permission of the publisher. Requests for permission must be made in writing to the publisher at the address written below.

Manufacturer and customer service

EL-Cell GmbH

Tempowerkring 8

21079 Hamburg – Germany

Telephone: +49 40 79012-734

Telefax: +49 40 79012-736

Email: info@el-cell.com

Website: el-cell.com

Technical support

Telephone: +49 40 79012-734

Email: support@el-cell.com

Website: el-cell.com/support/technical-support/

Please always quote the serial number on the nameplate when making customer service inquiries.

Shipping address for repairs

EL-Cell GmbH

Tempowerkring 8

21079 Hamburg - Germany

Please be sure to contact our customer service department before making a return. We will not open or process shipments without a completed decontamination report or RMA.

Content

1 Preamble 5

1.1 Purpose and target audience 5

1.2 Storage instructions 5

1.3 Obtaining documents and information 6

2 Product description 7

3 Features 7

4 Working principle of the PAT-Cell 8

5 Variants 9

6 Safety precautions 9

7 Cell Assembly 10

7.1 Using metal sealing rings 11

7.1.1 Installing metal sealing rings 12

8 Disassembly and Cleaning 14

9 Changing the Lid Spring 15

9.1 Changing the Lid Spring in the Screw Cap (PAT) 16

9.2 Changing the Lid Spring in the Screw Cap Insulated (PAT) 17

10 Unpacking 19

11 Technical data 20

11.1 Compatible PAT Docking Stations 20

12 Consumables 21

13 Accessories 22

14 Spare parts 24

15 Warranty 26

1 Preamble

1.1 Purpose and target audience

This manual covers the structure, function, operation and maintenance of the device described. It is intended for the end users of the device. An end user can be described as any person who interacts directly with the device described. The term "end user" usually includes laboratory personnel who have been specifically trained to operate this instrument and are familiar with all the precautions required to work in the laboratory.

Only an authorized and properly qualified and experienced person 18 years of age or older may use the device described, who:

- has read and understood these installation and operating instructions
- is familiar with the installation and operation of this or a similar device
- is aware of all possible dangers and acts accordingly

1.2 Storage instructions

Make sure you have read and understood the complete instructions and all safety information before using this product. Failure to follow these instructions may result in minor or serious injury.

Follow all instructions. This will prevent accidents that could result in property damage or injury. Keep all safety information and instructions for future reference and pass them on to subsequent users of the product.

The manufacturer is not liable for property damage or injuries resulting from incorrect handling or failure to comply with the safety instructions. In such cases, the warranty becomes void.

1.3 Obtaining documents and information

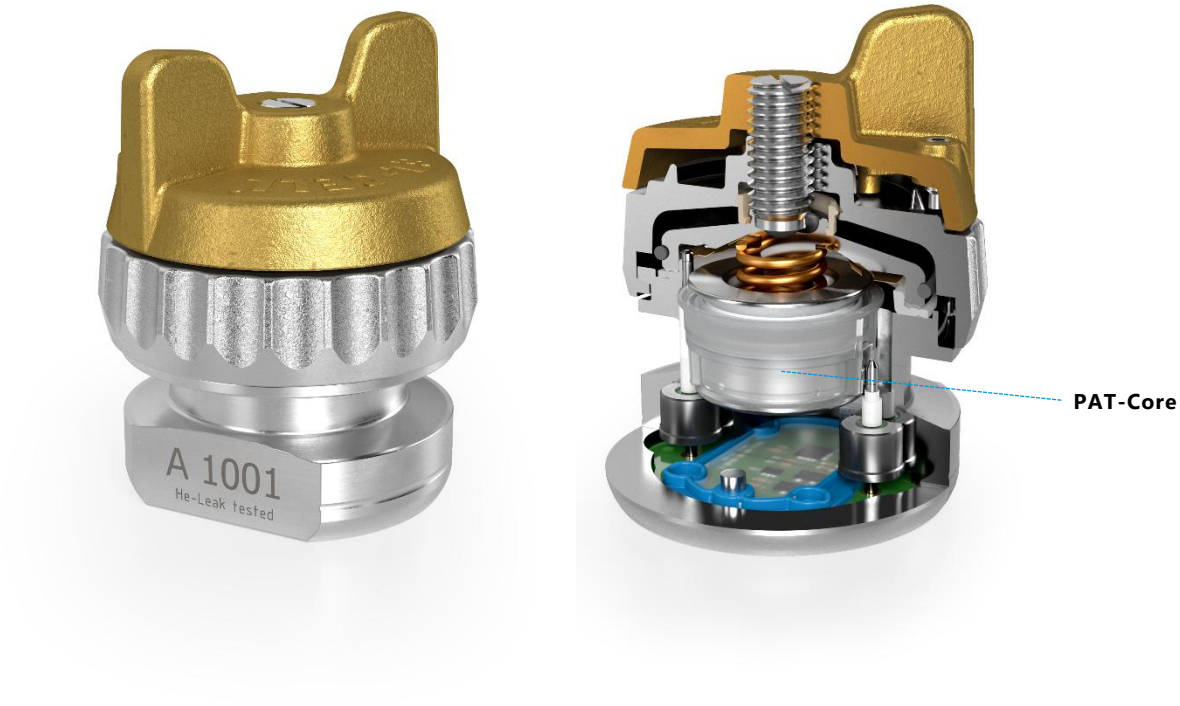
A current version of the documentation is available on the following website:

https://el-cell.com/support/manuals/

Alternatively, you can scan this QR code,
to access the website:

2 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.



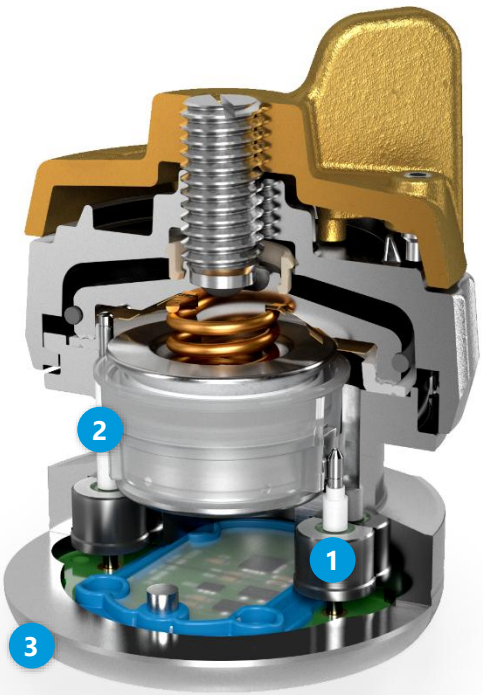
3 Features

- 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
- PAT-Button for automatic cell identification in EL-Software
- Compatible with metal seal lid for using aluminum lid seal
- Helium leak tight

4 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.

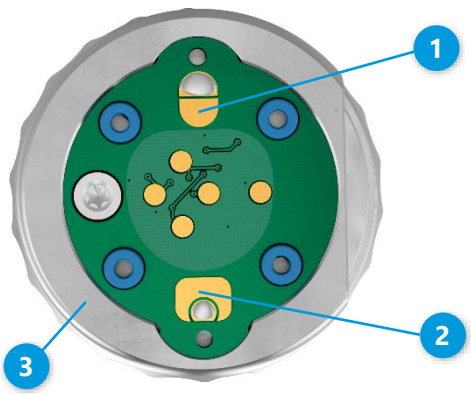


PAT-Cell

1 Contact area
Reference electrode

2 Contact area
Upper electrode

3 Contact area
Lower electrode



Cell bottom

5 Variants

PAT-Cell M



Features

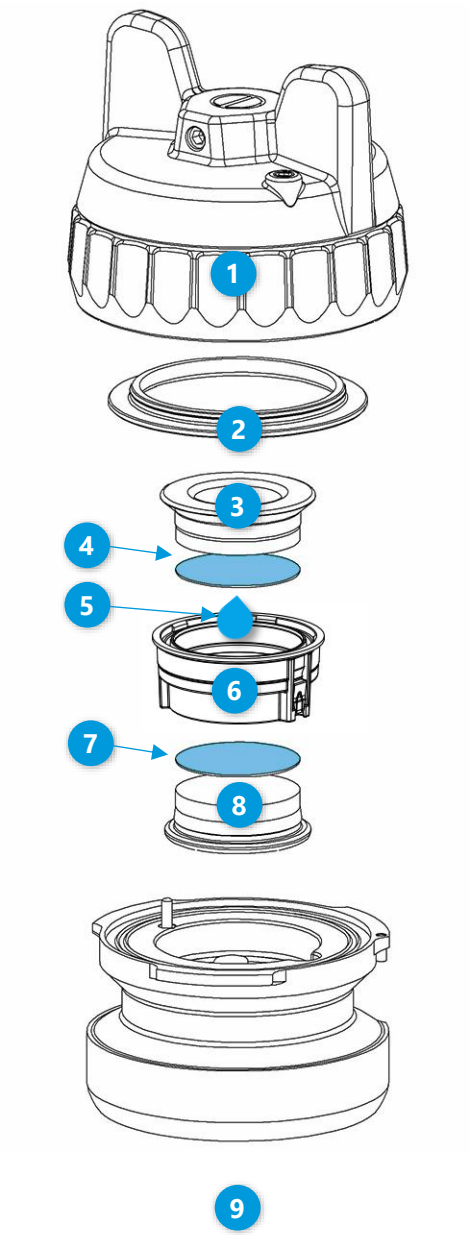
- Insulated cell lid for use with metal lid seals

6 Safety precautions

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

7 Cell Assembly

This section describes how the PAT-Cell has to be assembled to conduct proper battery tests. Please note that the assembly has to take place under a 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 various gap sizes to accommodate 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 µL 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. Insert a new **sealing ring (2)** into the screw cap (PE or metal seal) or place it on the cellbase (flat metal sealings, see chapter 7.1.1)

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

11. Tighten the wing nut clockwise to seal the cell.

12. Attach the cell to a free socket of a PAT docking station or PAT-Tester.

7.1 Using metal sealing rings

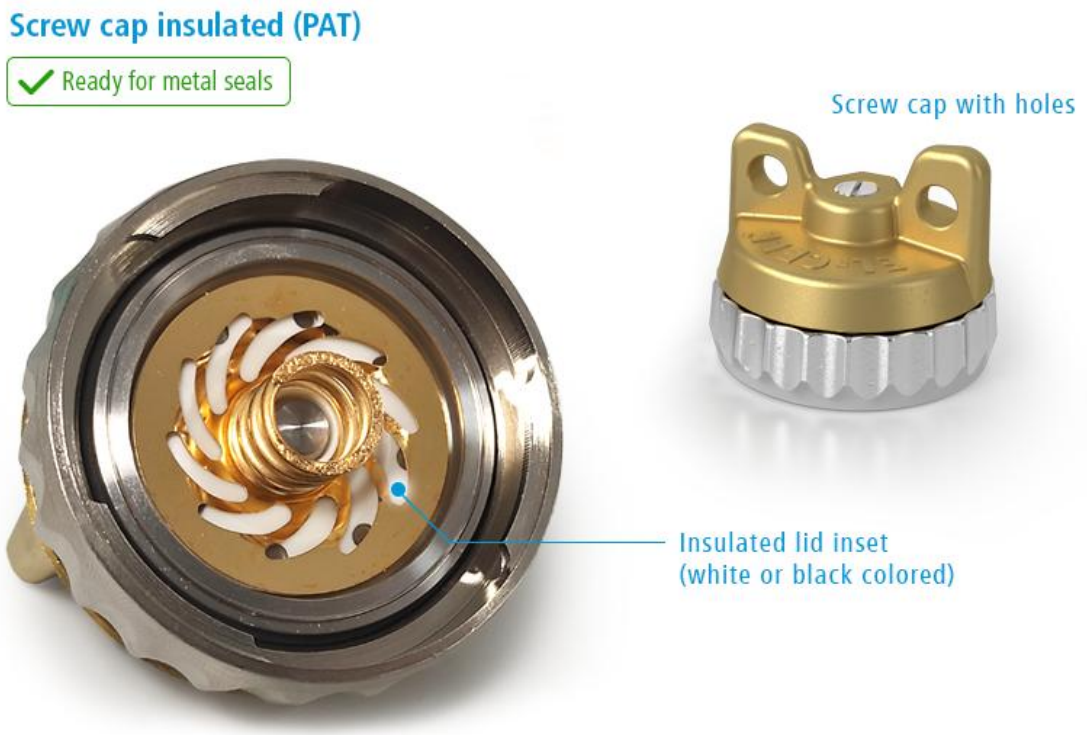
NOTICE

Please note when using metal sealing rings:

Make sure that a compatible lid for metal seals is installed. It can be recognized by the following two features.

- It has two holes on the top.
- It features a white or black inset made of PPS in the lid.

As the two holes can also be found on older cell lids without insulation, you should always check whether the inset is present. Non-compatible cell lids have no inset at all. The use of a non-compatible screw cap can result in a short circuit.



7.1.1 Installing metal sealing rings

When fitting the metal sealing ring, please note the differences between the available products.Whilst the aluminium sealing ring ECC1-00-0232-G is pressed into the, the flat metal seals ECC1-00-0232-M (Cu) and ECC1-00-0232-N (Al) are fitted differently.



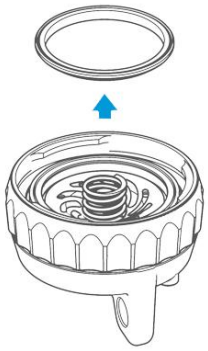
ECC1-00-0232-G: Insertion into the lid





Flat sealing rings ECC1-00-0232-M (left) and ECC1-00-0232-N (right): Placing on the cell base

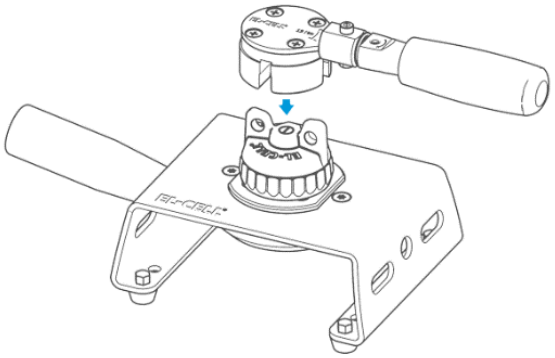
For assembly, follow the steps below when installing the cell inside the glovebox:



1. If present, first remove the sealing ring from the cell lid.



2. Place the new flat sealing ring on top of the cell base.



3. Place the cell lid on top and tighten the cell using the torque wrench from the Metal Seal Mounting Kit. We recommend inserting the cell into the assembly block.

8 Disassembly and Cleaning

When working with aprotic, moisture-sensitive electrolytes such as $LiPF_6$, it is best to always leave the cell base and cell lid in the glove box and only expose the PAT core components to room air for cleaning or disposal.

Note that excess electrolyte may leak from the PAT-Core and cause contamination in the cell base and on the contact pins. For standard electrodes and standard separators, use 100 µl electrolyte. If the cell base is contaminated with electrolyte, clean it in the glove box with a cloth and a battery-compatible solvent such as DMC.

If the cell base or lid has been in contact with ambient air or if they are being used for the first time, they must be dried in a vacuum at 80°C for at least 12 hours before use.

Stainless steel plungers can be cleaned with water, acetone, or ethanol. If necessary, persistent stains can be removed from the plungers with aqueous nitric acid (20%, 2 hours at room temperature). Insulating sleeves made of PP are intended for single use. Insulating sleeves made of PEEK or PPS can be cleaned with water, acetone, or ethanol and are reusable after careful drying (120°C, vacuum, >12 hours).

Never immerse the cell base in liquid. In particular, avoid contact of the electronic components on the bottom of the cell base with liquid.

Notes:

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

9 Changing the Lid Spring

The lid spring can be changed to allow different forces to be applied to the cell stack. Other springs are available; see Chapter 13 for more information.

Follow these steps to change the spring. Depending on the lid design, different procedures are necessary.

9.1 Changing the Lid Spring in the Screw Cap (PAT)



The Screw Cap (PAT) is the default lid variant for the PAT-Cell.



Remove the installed spring by pulling it off by hand. If it is stuck, it can also be loosened with a suitable tool (e.g., the back end of tweezers or a screwdriver).



Now press the new spring evenly onto the pin until it touches the disc spring.



Check that the spring is seated correctly by bending it in all directions.

9.2 Changing the Lid Spring in the Screw Cap Insulated (PAT)



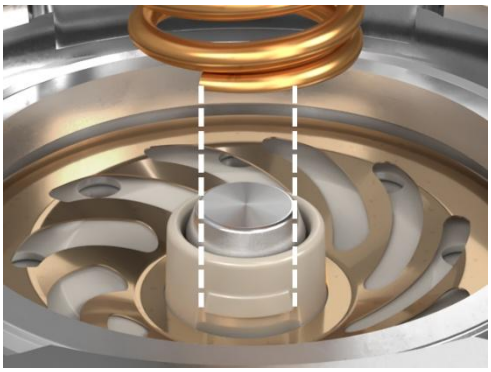
The Screw Cap Insulated (PAT) comes as default with the PAT-Cell M.



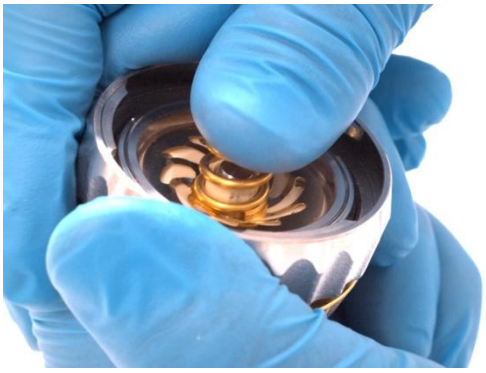
Remove the installed spring with a suitable tool (e.g., the back end of tweezers or a screwdriver). Be careful not to damage the PEEK part at the pin.



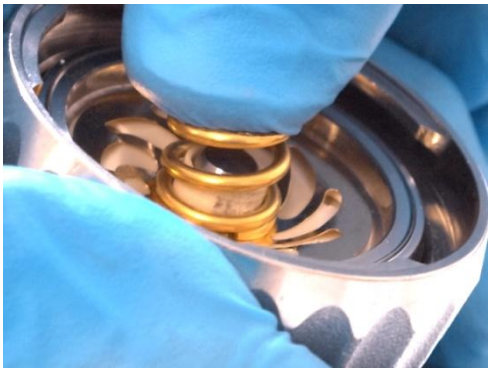
Note: There is a high and a low lug on the pin used to attach the spring.



Position the new spring aligned with the high lug as shown in the image.



Now press the spring onto the pin until it touches the disc spring.



Check that the spring is seated correctly by bending it slightly in all directions.

10 Unpacking

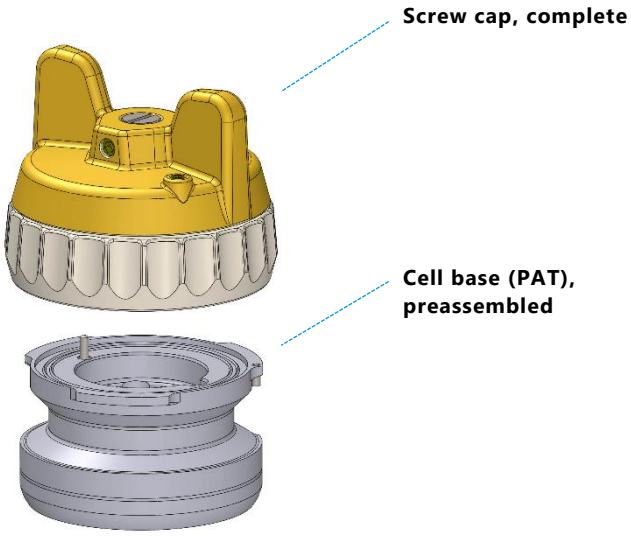
Check the contents of the package against the list given below to verify that you have received all of the required components. Contact EL-CELL if anything is missing or damaged.

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

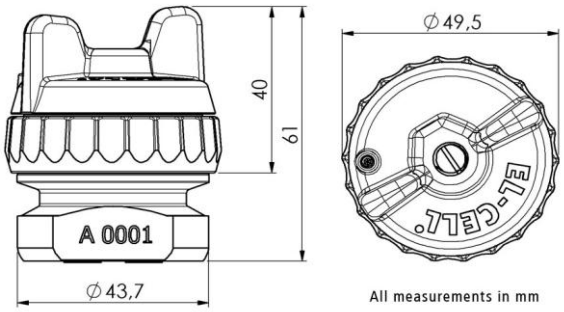
List of components:

PAT-Cell test cell without PAT-Core

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



11 Technical data



- Diameter: **49.5 mm**
- Height: **61 mm**
- Weight: **0.4 kg**
- Electrode diameter: **18 mm**
- Temperature resistance **-20 to +80 °C**

11.1 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

11.2 Spring forces in relation to the thickness of the upper electrode:

Lid Spring	Force applied to the cell stack*
FED9028 (default)	40 N ± 10%
FED9079	105 N ±10% if used with an aluminum lid seal 115 N ±10% if used with a PE lid seal
FED9052	7 N ± 30%

* These values apply to an upper electrode thickness ranging from 0 to 0.8 mm. Within this range, the electrode thickness has no significant influence on the force.

12 Consumables

Lid Seals (single-use):

- Sealing ring, PE (10 pcs) ECC1-00-0232-A/X
- Sealing ring, PTFE (10 pcs) ECC1-00-0232-B/X
- Sealing ring, Al (10 pcs) ECC1-00-0232-G/X
- Sealing ring, Al (flat) (10 pcs) ECC1-00-0232-N/X
- Sealing ring, Cu (flat) (10 pcs) ECC1-00-0232-M/X

13 Accessories

Screw cap for metal lid seals



This optional screw cap enables the use of metal sealing rings made of aluminum in the PAT-Cell. Metal seals provide the highest level of tightness against the ambient atmosphere and are therefore best suited for stable, long-term measurements. The cap is fully compatible with all other sealing materials for the PAT series. This lid is already included in the PAT-Cell M.

- Screw cap insulated (PAT), order no.: ECC1-00-0236-D

Compression spring (Au), FED9079



This optional lid spring applies the following force to the cell stack:

- 105 N ±10% if used with an aluminum lid seal
- 115 N ±10% if used with PE lid seal.

These values apply to an upper electrode thickness ranging from 0 to 0.8 mm. Within this range, the electrode thickness has no significant influence on the force.

- Compression spring 1,6x11, 6x8, L: 11,33 (Au, 5 pcs), Order no.: FED9079/V

Compression spring (Au), FED9052



This optional lid spring applies a force of 7 N ± 30% to the cell stack:

This value applies to an upper electrode thickness ranging from 0 to 0.8 mm. Within this range, the electrode thickness has no significant influence on the force.

- Compression spring 0.85x9.25x12.5x2.31 (Au) (5pcs) Order no.: FED9052/V

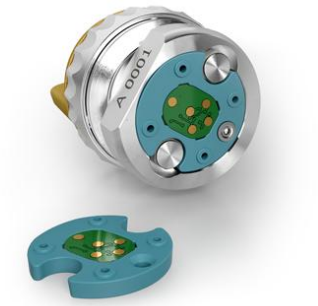
Metal seal mounting kit



This toolkit is designed to ensure the correct installation when using metal lid seals. The assembly block holds the cell in place, while the torque wrench enables you to secure the cell lid with the recommended torque.

- Metal seal mounting kit, order no.: ECC1-02-0040-A

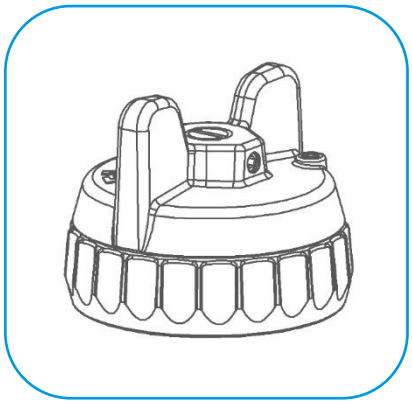
PAT-Button Upgrade Kit



This upgrade kit can be used to retrofit an older PAT-Cell with a PAT-Button. The PAT-Button enables a PAT-Tester potentiostat to immediately recognize the inserted cell and display its ID and cell type.

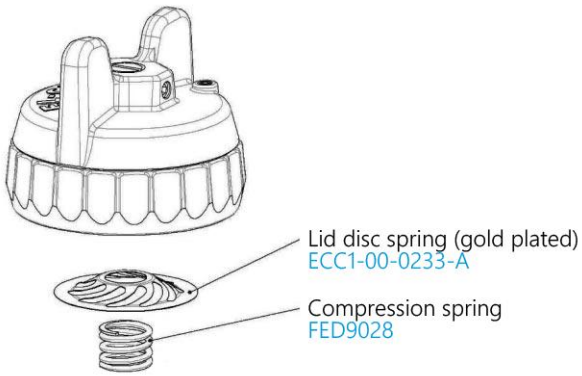
- PAT-Button Upgrade Kit for PAT-Cell (Button Kit II), order no.: ECC1-00-0249-C

14 Spare parts

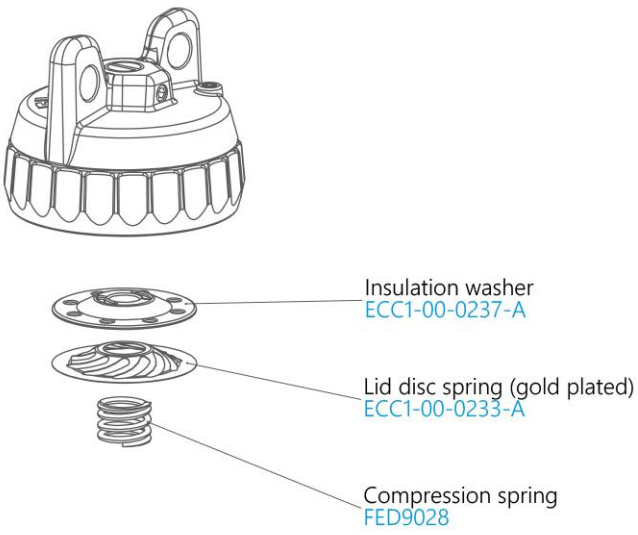


14.1 Components screw cap

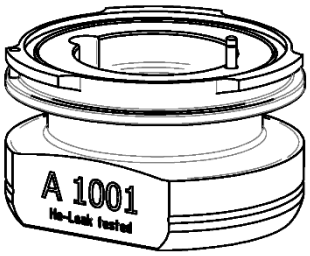
PAT-Cell

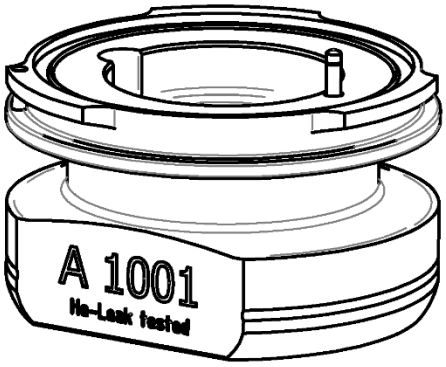


PAT-Cell M



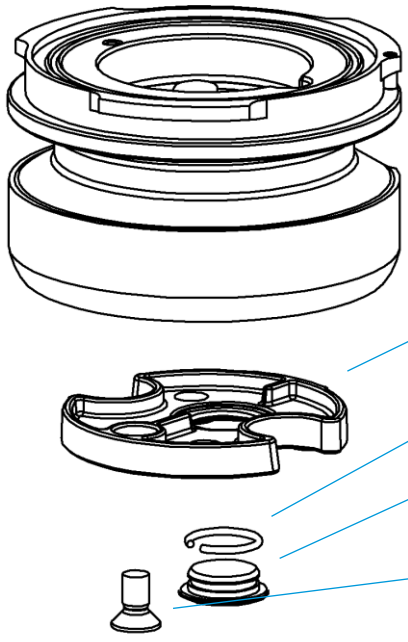
14.2 Components cell base





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

15 Warranty

For a period of one year from the date of shipment, EL-Cell GmbH (hereinafter Seller) warrants the goods to be free from defects 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. The buyer's exclusive remedy is repair or replacement of defective and nonconforming goods, or, at the Seller's option, the repayment of the price.

Seller excludes and disclaims any liability for lost profits, personal injury, interruption of service, or 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 the 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, the 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.