EL-CELL®
electrochemical test equipment

User Manual

Release 1.1

PAT-Tester-i-16

Disclaimer

EL-Cell GmbH makes no assurances or warranties concerning 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 anyone's notice.

The information provided in this documentation includes general descriptions and/or technical characteristics regarding the equipment performance 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 misusing 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 component repairs.

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

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 contacting customer service.

Shipping Address for Repairs

EL-Cell GmbH
Tempowerkring 8
21079 Hamburg
Germany

Please get in touch with our customer service department before making a return. Without a completed decontamination report or RMA, we will not open or process shipments.

Content

1 Preamble

1.1 Purpose and Target Audience

This manual describes the structure, function, operation, and maintenance of the PAT-Tester-i-16. It is intended for the device's end users, who can be any person who interacts directly with it. The term "end user" usually includes laboratory personnel trained to operate this instrument and familiar with all the precautions required to work in the laboratory.

Only an authorized, adequately qualified, and experienced person 18 years of age or older may use the PAT-Tester-i-16 machine which:

- 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

Before using this product, ensure you have read and understood the complete instructions and all safety information. 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 product users.

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 For Your Safety

2.1 Explanation of the Safety Instructions

Specific recurring terms and symbols are used in these instructions and on the appliance to warn you of dangers or to give you essential information to prevent injury and damage. Observe and follow these instructions and regulations to avoid accidents and damage. These terms and symbols are explained below.

2.1.1 Terms used

DANGER
"Danger" indicates an imminently hazardous situation that, if not avoided, could result in death or severe injury.

WARNING
"Warning" indicates a potentially hazardous situation that, if not avoided, could result in death or severe injury.

CAUTION
"Caution" indicates a hazard that, if not avoided, could result in minor or moderate injury.

NOTES
"Note" indicates important or valuable additional information.

2.1.2 Symbols used

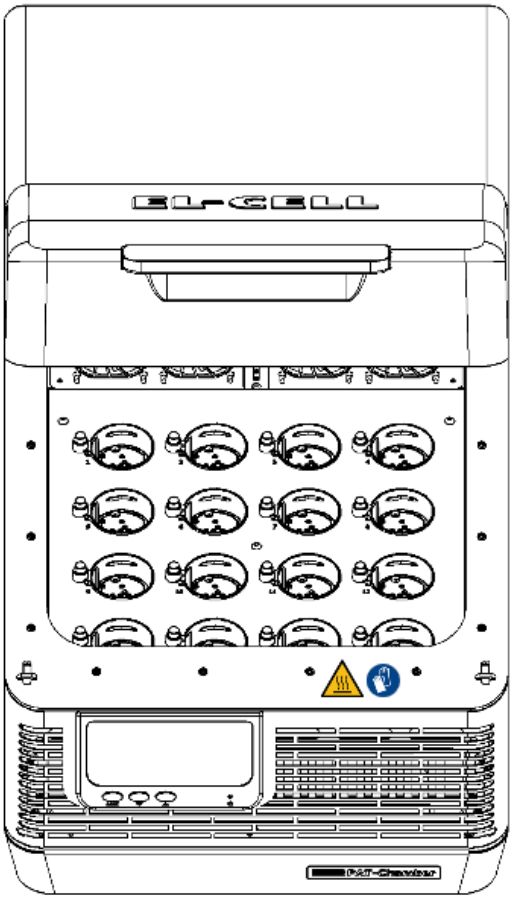
Warning symbols (warn of a danger)	
	
Danger of electric shock	Hot surface
Mandatory signs (prescribe an action)	
	
Wear gloves	Pull out the mains plug

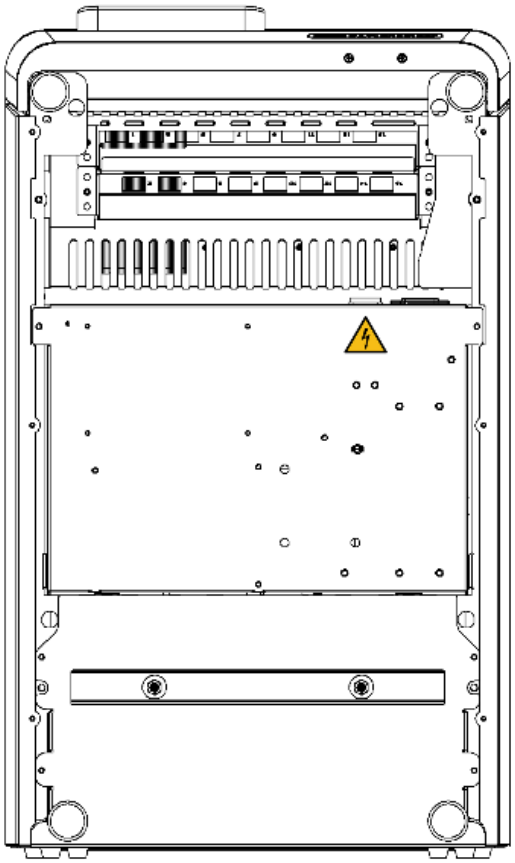
2.2 Product Safety and Hazards

The device described is technically mature, manufactured using high-quality materials, and tested in the factory before delivery. It corresponds to the state-of-the-art and recognized safety regulations. Nevertheless, it still poses risks, which are described below.

Symbol	Meaning
 	**Electrical hazard!** When covers are removed, live parts may be exposed. If you touch these parts, you may suffer an electric shock. Disconnect the mains plug before removing any covers. Only qualified electricians may work on the appliances' electrical equipment.
 	**Hot surface!** The parts of the interior become hot during operation. There is a risk of burns. Do not touch the interior surfaces during operation without protective gloves.

2.2.1 Position of the Safety Symbols on the Product





2.2.2 Requirements for the Operating Personnel

The appliance may only be operated and maintained by persons of legal minimum age who have been instructed to use it. Personnel to be trained, instructed, or undergoing general training may only work on this appliance under the constant supervision of an experienced person.

2.3 Responsibility of the Owner

The owner of the device

- is responsible for the perfect condition of the appliance and for ensuring that it is operated as intended;
- is responsible for ensuring that persons who are to operate or maintain the appliance are professionally qualified to do so, have been instructed on the appliance, and have been familiarized with these operating instructions;
- must be familiar with the applicable regulations, provisions, and health and safety regulations and train personnel accordingly;
- is responsible for ensuring that unauthorized persons do not have access to the device;
- is responsible for ensuring that the operating personnel wears personal protective equipment, e.g., work clothing, safety shoes, protective gloves

2.4 Intended use

The PAT-Tester-i-16 is intended for charging and discharging electrochemical battery test cells in a temperature-controlled cell chamber in the temperature range from 10 to 80°C. Other uses can lead to danger and damage.

NOTE
The PAT-Tester-i-16 may only be used with test cells of the PAT series. Other cell types must be used with the adapters supplied by EL-CELL. Do not place any other objects in the cell chamber.

2.5 Modifications and Conversions

The PAT-Tester-i-16 must be converted or modified with authorization. No parts not approved by the manufacturer may be added or installed.

Unauthorized conversions or modifications will invalidate the device's CE conformity, and it may no longer be operated.

The manufacturer is not liable for damage, hazards, or injuries caused by unauthorized conversion, modifications, or non-compliance with this manual's instructions.

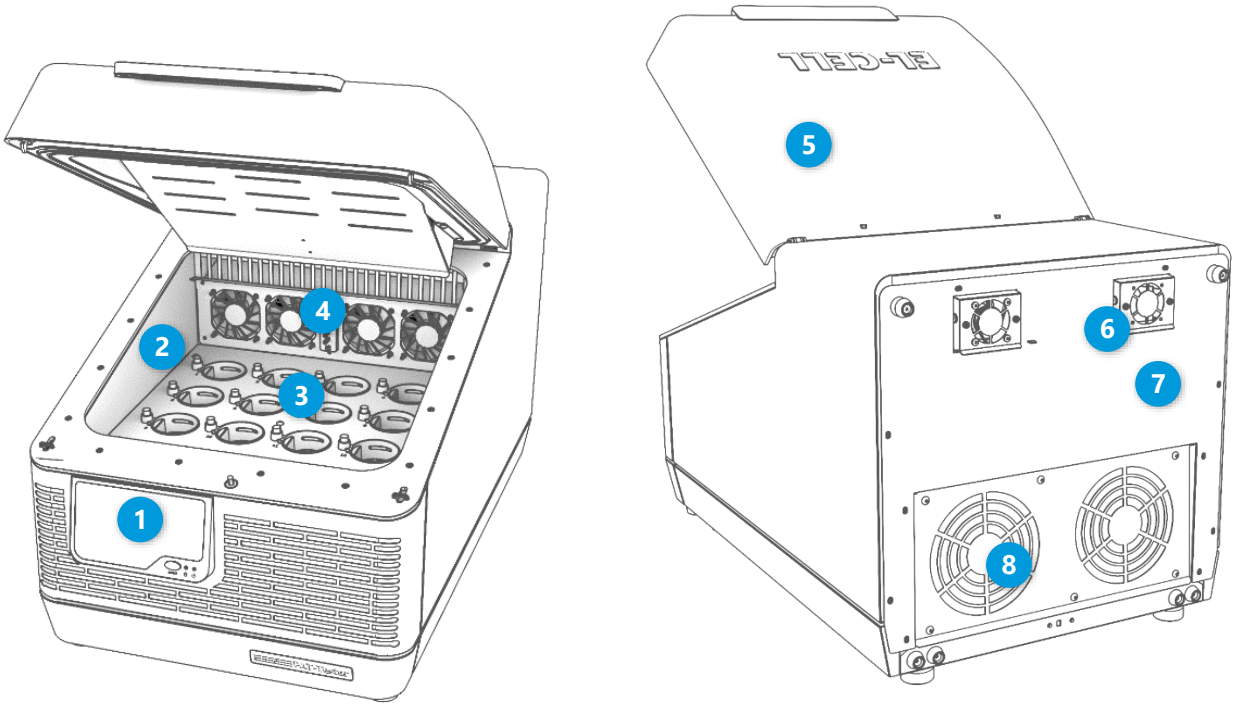
2.6 How to React in the Event of Faults and Irregularities

As the operator, you may only operate the PAT-Tester-i-16 if it is in perfect working order. If you notice irregularities, faults, or damage, **take the appliance out of operation immediately and inform your supervisor.**

2.7 Switching off the Device in an Emergency

In an emergency, pull out the mains plug to disconnect the device from the mains. This requires the socket that supplies the appliance to be found and accessible at all times.

3 Structure and Description of the Device



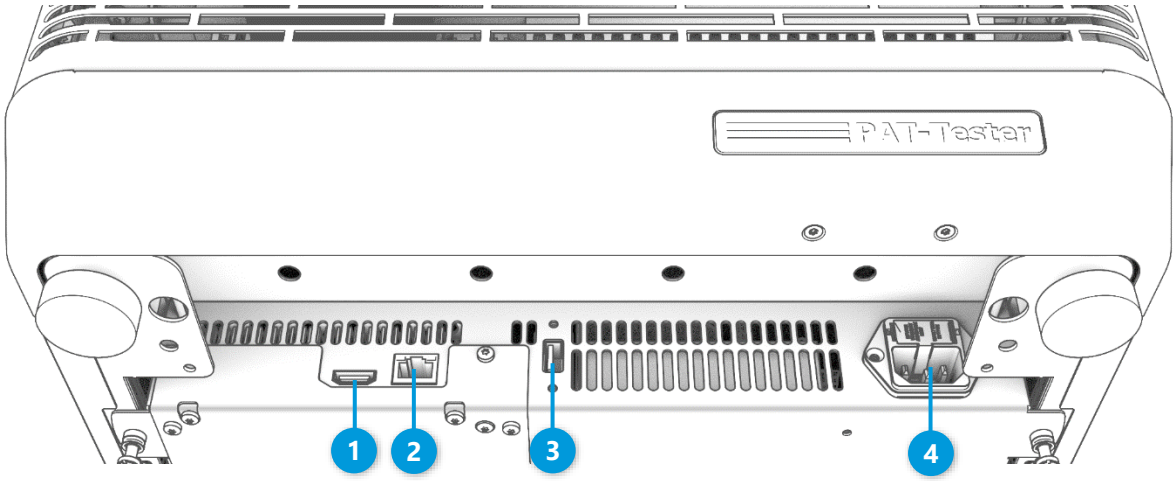
1. LC display, control LEDs, and function button
2. Temperature-controlled cell chamber
3. Cell connections (PAT socket)
4. Interior fan
5. Cover
6. Fan of the automatic venting system
7. Type plate
8. Fan

3.1 Description of the Device

The PAT-Tester-i-16 is a potentiostat/galvanostat and impedance analyzer with up to 16 independent test channels. Its temperature-controlled cell chamber can be heated to 80°C and cooled to 10°C using Peltier cooling and heating technology. The chamber contains 16 sockets for PAT system test cells. Other cell types must be connected using the adapters available from the manufacturer.

The PAT-Tester-i-16 has an internal control PC that stores the test data. This data can be retrieved and processed via the existing network interface, and the EL-Software control software is supplied for this purpose.

3.2 Connections and Interfaces



1. HDMI output (for diagnostic purposes only)
2. Ethernet connection
3. USB connection
4. Mains connection

3.2.1 Ethernet Interface

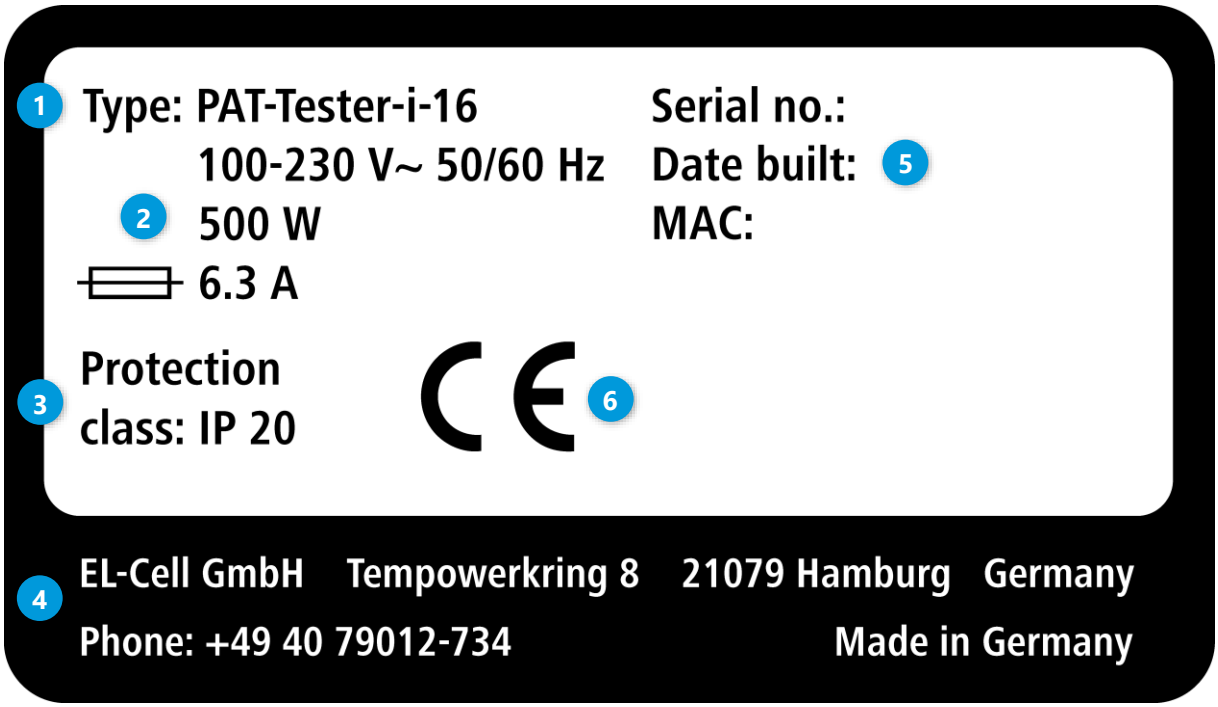
The PAT-Tester-i-16 has an Ethernet interface that can be operated using the EL-Software control software. Separate manuals, which can be downloaded from https://www.el-cell.com/products/el-cell-software/el-software/#downloads, provide information on the required network design and on setting up and operating EL-Software.

3.2.2 USB Connection

The USB connection is used for diagnostic purposes and to change the device's static IP. This change is made using the EL-Software control software. The steps required to change the IP are described in the EL-Software manual.

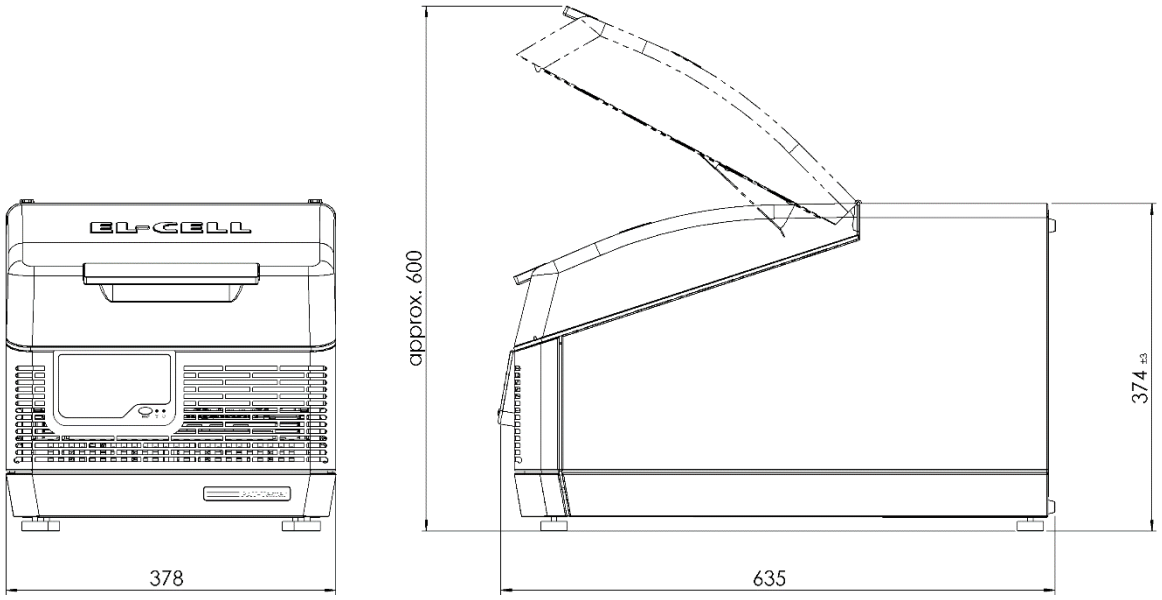
3.3 Type Plate

The type plate provides information about the device model, manufacturer, and technical data. It is attached to the back of the device (see Chapter 3).



1. Type designation
2. Operating voltage, connection/performance data
3. Protection class
4. Address and telephone number of the manufacturer
5. Serial number, build date, and MAC address of the network adapter
6. CE conformity

3.4 Technical Data



3.4.1 Dimensions

Weight	26 kg (without test cells)
Height	approx. 600 mm/375 mm (opened/closed cover)
Length	640 mm
Depth	380 mm

3.4.2 General Device Data

Device name	PAT-Tester-i-16
Type	Potentiostat/Galvanostat/Impedance Analyser with integrated temperature chamber
Temperature chamber	10 to 80°C
Test channel per device	1 to 16

3.4.3 Performance Data of the Individual Test Channels

General	
Control voltage	-7 to +7 V
Compliance voltage	-8 V to +8 V (no load)
Current	±100 mA
Cell electrode connections	Three electrodes, sense connections, Connection matrix
ADC	2x24 Bit
DAC	1x18 Bit
Bandwidth ranges	500 kHz 50 kHz 5 kHz
Slew rate	2.5 V/µs
Sampling interval (rate)	1 ms (1000 samples per second) with intelligent data recording
Input Impedance	>100 MΩ || 20 pF
Internal sampling buffer	100 GB
Computer Interface	1 GBit Ethernet Multiuser Device runs standalone (immune to network interruptions)
Voltage	
Acquisition voltages	Full cell voltage Both half-cell voltages Auxiliary voltage
Measurement accuracy	±0.02% of FSR (Full Scale Range)
Measurement noise floor	30 µV peak-peak typical
Control resolution	57 µV (18 Bit) EIS amplitude: 3 µV (additional 16 Bit DAC for EIS)
Current	
Current ranges	±100 mA ±10 mA ±1 mA ±100 µA Auto Range

Measurement noise floor	<1 µA @ 100mA <100 nA @ 10mA <10 nA @ 1mA <1 nA @ 100µA
Measurement accuracy	±0.05% of FSR
Control resolution	1 nA min. (18 Bit)
Impedance (each channel)	
Frequency range	100 µHz to 100 kHz
Impedance mode	PEIS and GEIS (simultaneous measurement of full- and half-cell impedances)
Impedance range	1 mΩ to 100 MΩ
EIS quality indicator	SFDR (Spurious Free Dynamic Range)
EIS drift correction	yes
EIS adaptive amplitude	yes
Other	
Temperature chamber	+10°C to +80°C, setpoint control in EL-Software
Additional Measurement (each channel)	Multiple digital I^2C bus sensors, e.g., for cell temperature and gas pressure, 1x analog voltage input, e.g., for dilatometer signal
Calibration	Fully automatic self-test and self-calibration with internal voltage references and internal calibration cells (maintenance-free)
Cell Identification	Supports PAT-Button for reading the unique test cell serial number

3.5 Applied Guidelines and Standards

The product described conforms with the following harmonized standards:

EN 61010-1:2010	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 1: Allgemeine Anforderungen (DIN EN 61010-1, VDE 0411-1:2011-07)
	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements (IEC 61010-1:2010 + Cor. :2011)
EN 61010-2-201:2014	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte - Teil 2-201: Besondere Anforderungen für Steuer- und Regelgeräte (DIN EN 61010-2-201:2014, VDE 0411-2-201:2014-01)
	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements for control equipment (IEC 61010-2-201:2013)
EN 61010-2-010:2015-05	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte - Teil 2-010: Besondere Anforderungen an Laborgeräte für das Erhitzen von Stoffen (DIN EN 61010-2-010:2014; VDE 0411-2-010:2015-05)
	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements for control equipment (IEC 61010-2-201:2013)
EN 61326-1:2013	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen (DIN EN 61326-1:2013-07, VDE 0843-20-1:2013-07)
	EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

	(IEC 61326-2-3:2012)
EN 61326-2-3:2013-07	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 2-3: Besondere Anforderungen - Prüfanordnung, Betriebsbedingungen und Leistungsmerkmale für Messgrößenumformer mit integrierter oder abgesetzter Signalaufbereitung (DIN EN 61326-2-3:2013-07, VDE 0843-20-2-3:2013-07)
	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning (IEC 61326-2-3:2012)
EN 50581: 2013-02	Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe (DIN EN 50581; VDE 0042-12:2013-02)
	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

EL-CELL®

electrochemical test equipment

EU Declaration of Conformity

Manufacturer´s name and address: EL-Cell GmbH
Tempowerkring 8
21079 Hamburg
Germany

Product: PAT-Tester-i-16

The designated product is in conformity with the

- Low Voltage Directive (LDV) 2014/35/EU
- Electromagnetic Compatibility Directive (CEM) 2014/30/EU
- Restriction of Hazardous Substance Directive (RoHS) 2011/65/EU

and the following harmonised standards:

- Safety: IEC 61010-1
- EMC: IEC 61326

Emissions

EN 55011: Conducted Class B
EN 55011: Radiated Class A
EN 61000-3-2: Harmonic Current

Immunity

IEC 61000-4-3: EM field
IEC 61000-4-4: Burst
IEC 61000-4-5: Surge
IEC 61000-4-6: Conducted RF
IEC 61000-4-8: Magnetic Field
IEC 61000-4-11: Voltage Dip/Short Interruptions

Hamburg, 03.07.2020

Michael Hahn, CEO

This declaration certifies compliance with the above mentioned directives but does not include a property assurance.
The safety note given in the product documentation which are part of the supply, must be observed.

4 Delivery and Installation

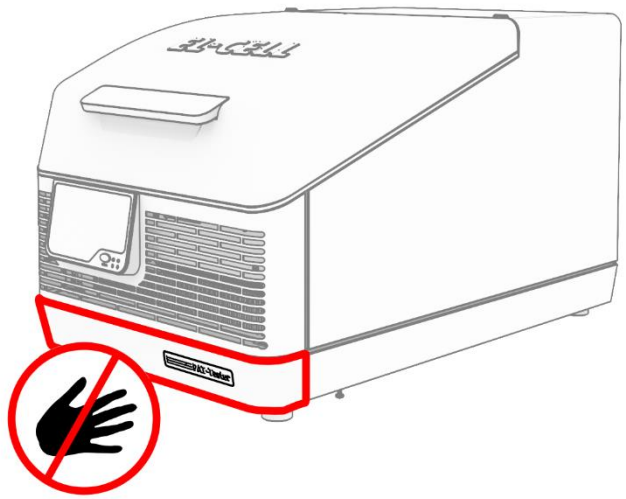
4.1 Delivery

The PAT-Tester-i-16 is packed in a cardboard box and delivered on a wooden pallet.

4.2 Unpacking

To avoid damage, do not unpack the device until it is at its installation location.

4.2.1 Safe Lifting and Transportation

⚠ CAUTION
Risk of injury from lifting heavy loads: Lift the appliance using transport straps or by lifting at the four lower corners with the help of two people.
Risk of injury: Do not lift the PAT-Tester-i16 using the lower front or main cover. 

4.2.2 Checking the Delivery for Completeness and Transport Damage

- Check that the scope of delivery is complete using the delivery note
- Check the appliance for damage.

If you notice any deviations from the scope of delivery or damage, please inform the carrier and the manufacturer

4.2.3 Recycling the Packaging Material

Dispose of the packaging material (cardboard, wood, foil) per the legal regulations in your country

4.2.4 Storage after Delivery

If the appliance is initially to be stored after delivery, please observe the storage conditions in Chapter 9.1.

4.3 Installation

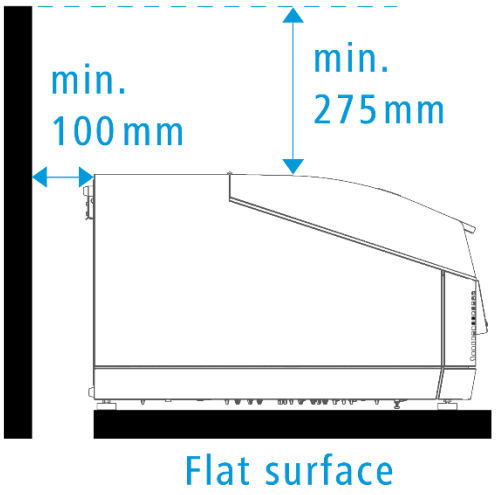
The installation site must be level, horizontal, and non-flammable. It must also be able to safely support the appliance's weight (see technical data) and have a power connection.

4.3.1 Minimum Space Requirement

The PAT-Tester-i-16 requires at least the following space (device dimensions plus required clearances) for installation:

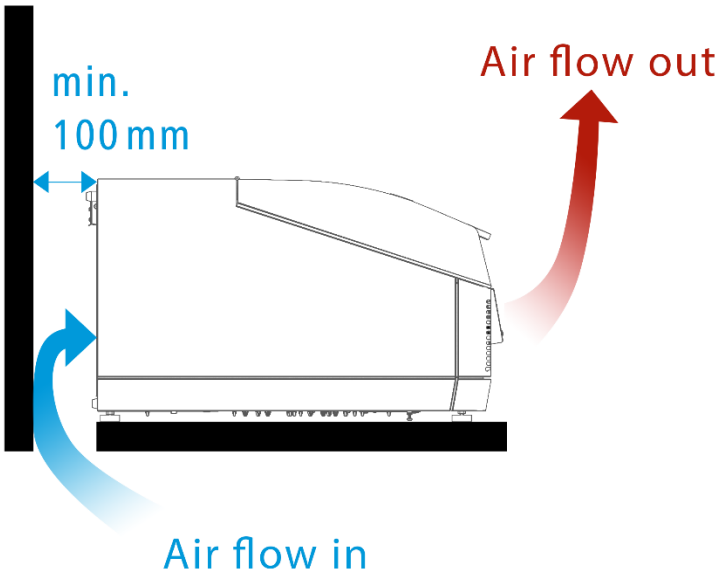
Depth: min. 740mm
Width: min. 380mm
Height: min. 650mm

The distance between the wall and the back of the appliance must be at least 10 cm.



4.3.2 Air Ventilation

Sufficient air circulation must be ensured at all times near the appliance. Ensure that the air inlets and outlets on the front and rear of the PAT-Tester-i-16 are not covered. This is particularly important if more than two devices are placed beside each other.



5 Start-up

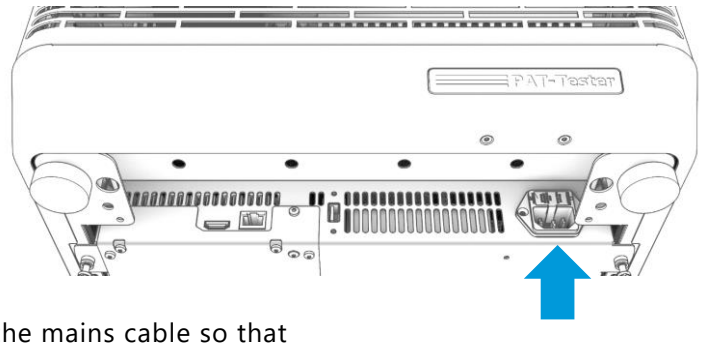
5.1 Connecting the PAT-Tester-i-16

Observe the country-specific regulations, connection, and power ratings (see rating plate). Also, ensure a secure protective conductor connection.

1. Place the device upright so the connections on the underside are easily accessible.

NOTE
Make sure that the cover is closed before you set up the device. Otherwise, it may swing open and be damaged.

2. Now connect the mains cable supplied to the appliance (see arrow) and the power supply.



Lay the mains cable so that

- it is always accessible and within reach and can be disconnected quickly, for example, in the event of faults or emergencies;
- there is no risk of tripping;
- it cannot come into contact with hot parts.

5.1.1 Switching on and off

The PAT-Tester-i-16 switches on when it is connected to the power supply.

There are two ways to turn off the device:

1. If the device is connected to your local network, you can access the PAT-Tester Administration Page via a web browser. To do this, enter the IP address on the device display with the addition :4712 as web address (Example 123.456.7.890:4712). You can now safely shut down the device via the “Shutdown” function under the menu item PAT-Tester Restart.

2. Disconnect the appliance from the power supply.

6 Operation and Control

The PAT-Tester-i-16, in particular, the temperature control of the cell chamber, is operated via the EL-Software control software. The corresponding manuals, which can be downloaded from the website (https://el-cell.com/support/manuals), provide further information on setting up and operating EL-Software.

The display on the device is only used to show various parameters. Press the selection button to change this data.

6.1 Display

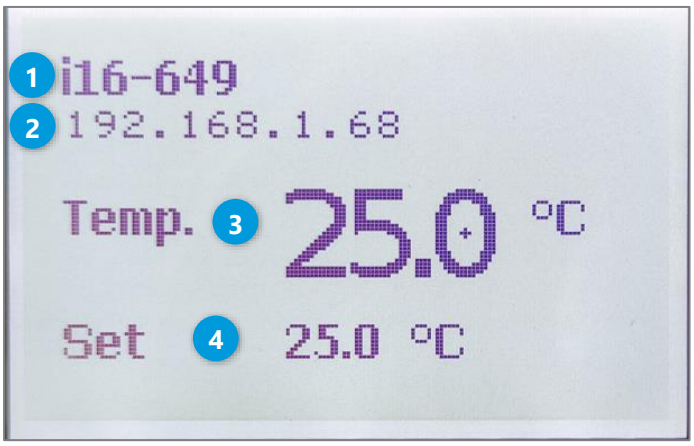
The display comprises the following elements:

1. LC display
2. Status LEDs of the test channels
3. Select button
4. LED for the operating status of the internal hard disk (left) and the device (right)

6.1.1 Information on the LC-Display

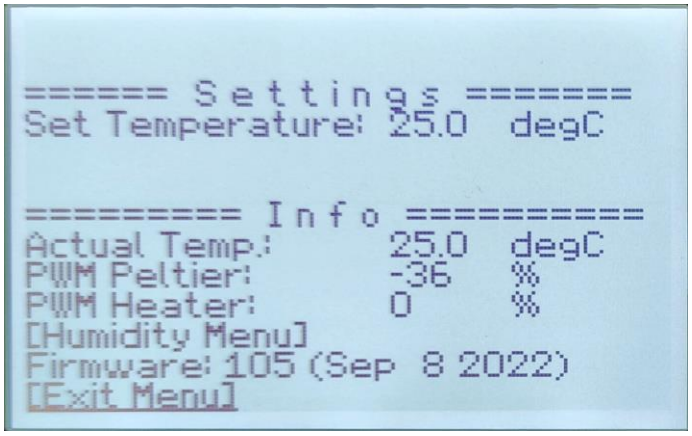
The views of the LC display can be changed using the selection button. They provide the following Information:

6.1.1.1 LC-Display: View 1 (Standard View)



1. Name of the device (the current device status can also be displayed here instead)
2. IP address
3. Actual temperature inside the cell chamber
4. Set temperature within the cell chamber

6.1.1.2 LC-Display: View 2

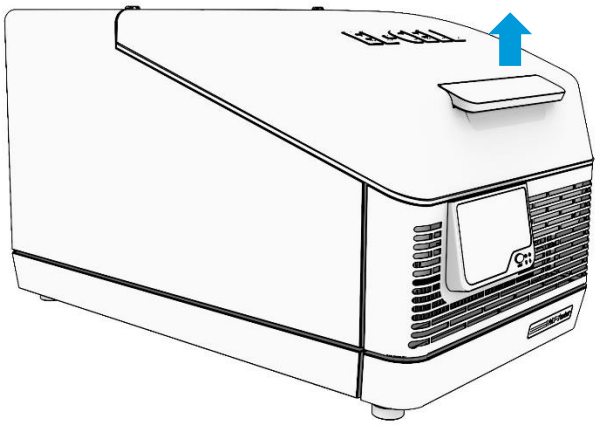


Display	Meaning
Set Temperature	Set the target temperature of the cell chamber.
Actual Temp	Current actual temperature
PWM* Peltier	Heating power (positive values) or cooling power (negative values) of the Peltier elements in percent (-100% to +100%).
PWM Heater	The heating power of the heating wire (in the cell chamber) is expressed in percent (0..100%).
Humidity Menu	Only accessible by EL-CELL technicians for diagnostic purposes
Firmware	Currently installed firmware

In certain situations, simultaneous heating and cooling can be displayed. This is used for dehumidification, where the Peltier elements serve as a cold trap.

*PWM= pulse width modulation

6.2 Opening the Lid



Pull the handle to open the lid of the cell chamber. When closing, make sure that you hear the lid click into place.

6.3 Inserting and Removing Test Cells

The PAT-Tester-i-16 has 16 sockets for inserting PAT series battery test cells. Using the adapters available from the manufacturer, other cell formats can be connected to the PAT-Tester-i-16.

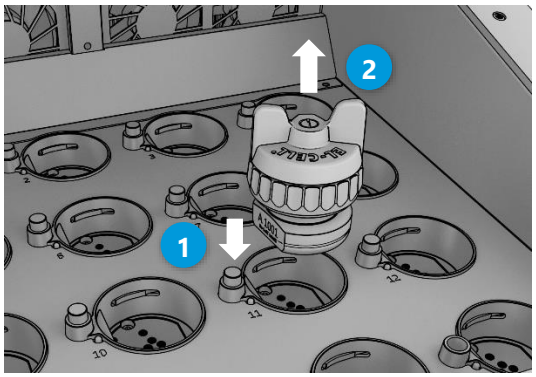
CAUTION
 The inner surface of the cell chamber and objects inside it can become very hot, depending on the set temperature. There is a risk of burns.
 Wear protective gloves!

6.3.1 Inserting a PAT Series Test Cell

To insert the cell, insert it into the PAT socket until you hear the latch click into place. Only then is electrical contact guaranteed.

6.3.2 Removing a PAT Series Test Cell

To remove a cell, press the silver button next to the PAT socket to release the lock (1) and remove the cell (2).



7 Faults, Warning and Error Messages

WARNING

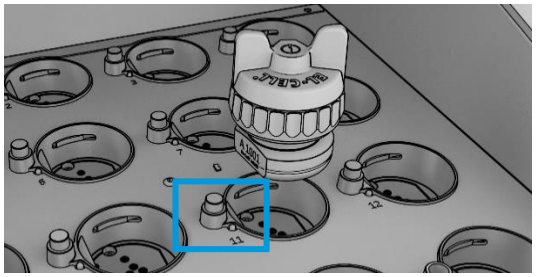
When covers are removed, live parts may be exposed. If you touch these parts, you may suffer an electric shock.

Disconnect the mains plug before removing any covers. Only qualified electricians may work on the appliances' electrical equipment.

Do not attempt to rectify device faults, but contact EL-Cell GmbH technical customer service.

7.1 Explanation of the Acoustic and Visual Signals

7.1.1 Visual Signals from the Channel LEDs



Signal	Meaning
Channel LED does not light up.	During device startup and firmware update (up to 15 min), else no channel board is equipped, or software/hardware fault
Channel LED lights up red.	Channel reset (up to 10 sec), device startup, or firmware update (up to 15 min), else software/hardware fault
Channel LED lights up green.	The channel is functioning normally.
Channel LED flashes red during battery test.	A script runtime error has occurred. Please acknowledge the error in the EL-Software cell view.
Channel LED flashes red before/after battery test	Calibration check failed or software/hardware fault. Please contact EL-CELL and provide the channelboard log file from the device administration web page.

7.1.2 Visual Signals from the Device LEDs

Left LED: Embedded PC HDD (EPC HDD), Right LED: Mainboard Power (MB PWR)

Signal	Meaning
EPC HDD lights up green.	Embedded PC is turned on.
EPC HDD lights up red.	Embedded PC SSD is active.
MB PWR does not light up.	Mainboard firmware update (up to 15 min), else software/hardware fault
MB PWR lights up green.	Mainboard is powered on and functioning normally.
MB PWR lights up red.	Mainboard startup/reset, PAT-Controller / embedded PC startup or firmware update (up to 15 min), else software/hardware fault

7.1.3 Visual Signals on the Display

7.1.3.1 Error Codes

This list shows the error codes that may appear on the PAT-Tester-i-16 display. Please state the error code in your message to our technical customer service.

Error Code	Meaning	Effects
WD	*Watchdog reset:* Indicates that the mainboard and temperature controller have been reset due to CPU inactivity. Possible causes are electrical/ESD/EMC problems or problems with the firmware.	Temperature control starts again after resetting.
Ovrtmp	*Over-temperature:* The cell chamber temperature is more than 90°C or the temperature of the temperature controller board is more than 70°C. There may also be a sensor error or an I^2C bus error.	The temperature controller stops heating and cooling during overtemperature conditions.
temp	The main temperature is not valid (either out of range or due to a sensor/I^2C bus error)	The temperature controller stops heating and cooling for the duration of the fault.
Si	I^2C bus: Main temperature sensor	The temperature controller stops heating and cooling for the duration of the fault.

7.1.3.2 Status Messages

Status messages can appear in the top line of the LC display instead of the device name. They provide information about the current operating status. They can also contain prompts for the operating personnel.

Message	Meaning	Recommended Action
Booting...	The device is in the start-up process and is not yet ready for operation.	
Waiting for Server...	The network connection to the EL-Software server is interrupted.	The device will function normally but cannot transmit measurement data to the server or receive new commands. Re-establish the LAN connection.
Please close the lid!	The set target temperature cannot be reached or maintained for this period. Humidity from the outside air may condense on freezing cells. **Note:** The air circulation fans do not rotate while the cell chamber is open. This is the intended behavior.	Close the lid to the cell chamber.

7.1.4 Acoustic Signals

Acoustic signals	Meaning
Beep once every 10 seconds (increasing beep duration from 20ms to 500ms)	Sounds as long as the lid to the cell chamber is open. Close the lid.

7.1.5 Network Failure

In the event of a network failure, the connection between the device and the EL-Software server is interrupted. However, measurements already started by the PAT-Tester-i-16 will continue to run normally. Any measurement data is stored temporarily in the device.

Once the network connection is re-established, the temporarily stored measurement data is transferred to the EL-Software server.

8 Maintenance and Repair

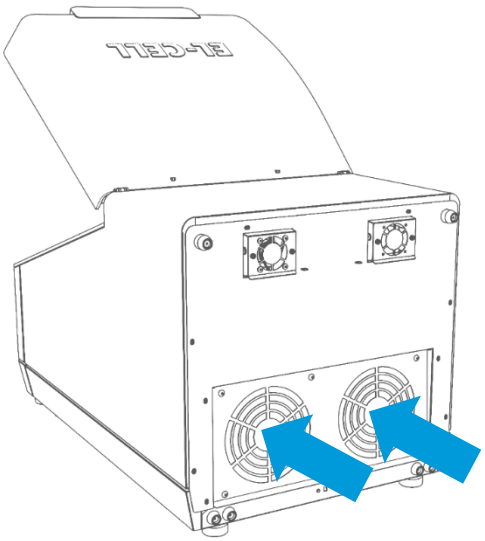
8.1 Cleaning

Wipe the PAT-Tester-i-16 with a damp cloth. Do not use aggressive chemicals. The metal surfaces inside the device can be cleaned with commercially available stainless steel cleaning agents. Suppose rust spots appear on the interior surface due to soiling. In that case, the affected areas must be cleaned and polished immediately.

Protect the PAT-Tester-i-16 from dust and splashing water.

8.1.1 Cleaning the air filters

The air filters must be cleaned every six months to prevent damage to the device due to reduced airflow and the resulting overheating. It is sufficient to vacuum them with a vacuum cleaner.



8.2 Removing and Adding a Channel Board

The PAT-Tester-i-16 can be equipped with up to 16 test channels. The electronics of each channel are located on a separate circuit board (channel board). Follow the steps below to install or remove it:

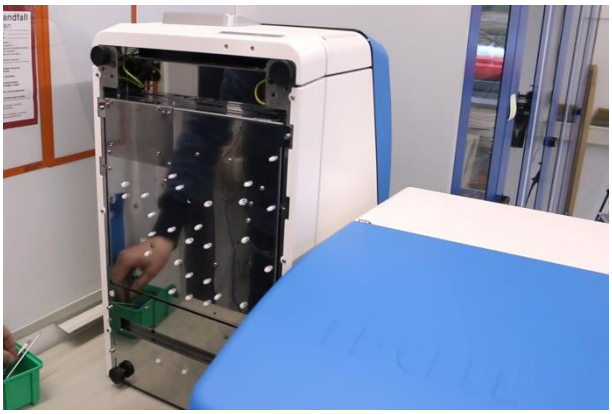
WARNING

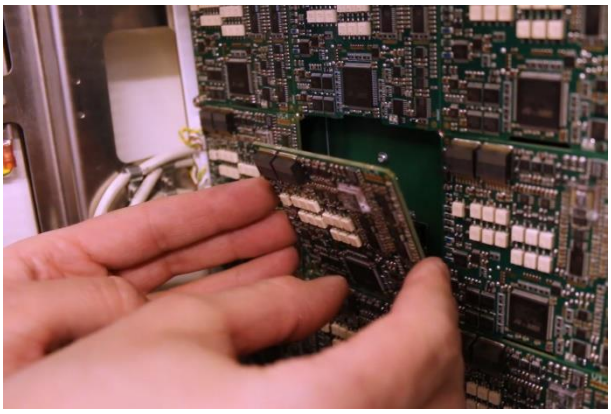
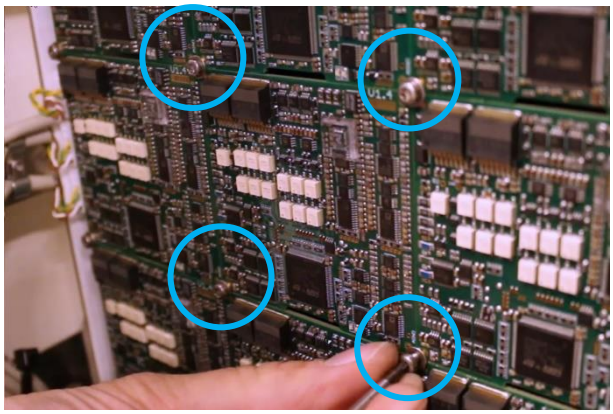
When covers are removed, live parts may be exposed. You may suffer an electric shock if you touch these parts.

Disconnect the mains plug before removing any covers. Only qualified electricians may work on the electrical equipment of the appliances.

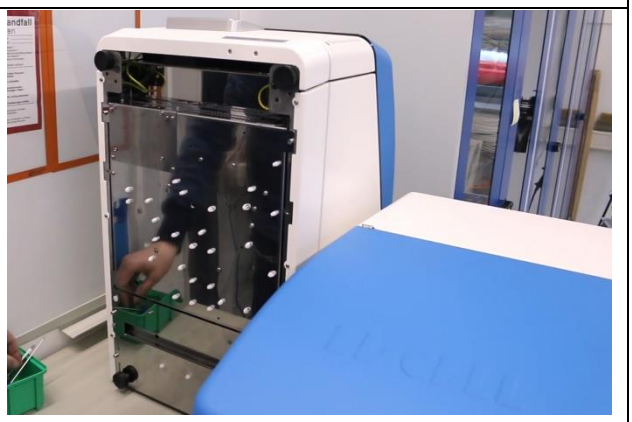
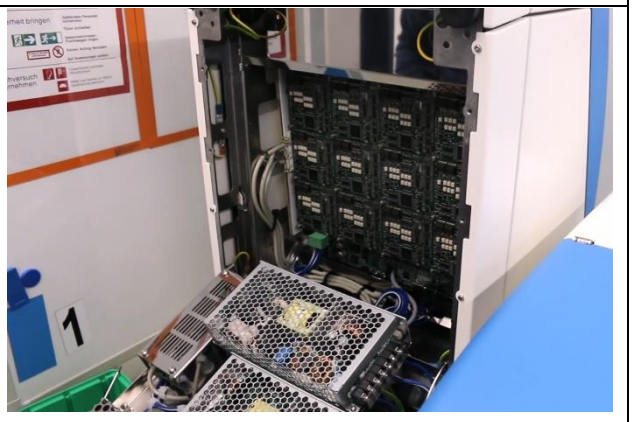
Take ESD protective measures to prevent damage to the electronics.

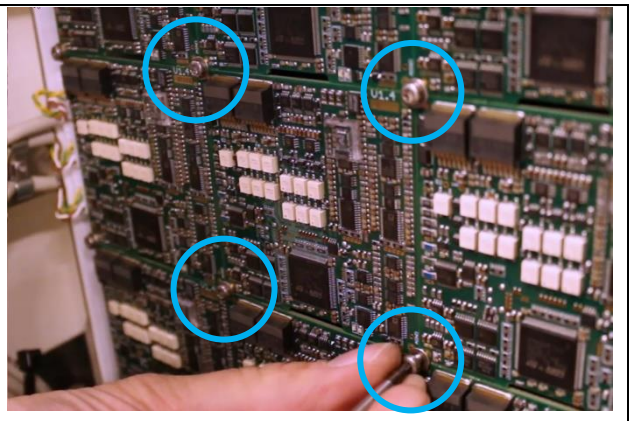
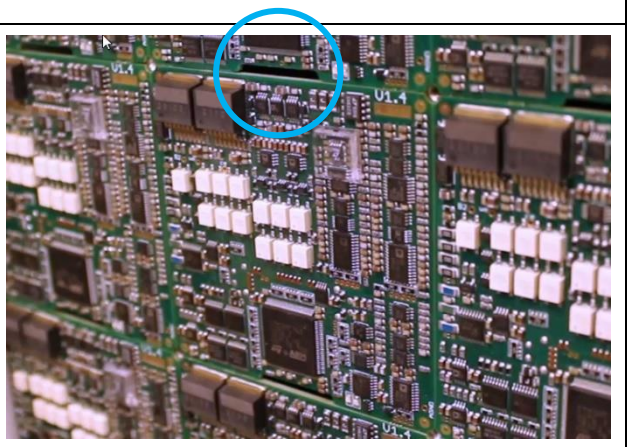
8.2.1 Installing a Channel Board

1. Turn the PAT-Tester-i-16 upright. Ensure the cover is closed and locked; otherwise, it may swing open and be damaged.	
2. Remove the two screws on the underside of the device.	
3. Now carefully tilt the underside downwards.	

4. Carefully insert the channel board. Ensure the connector on the back is correctly connected to the main board.	
5. Secure the channel board with the four retaining screws. Ensure that these are only hand-tightened.	
6. Close the housing again and secure the underside with the two screws. You can then switch on the device. The inserted channel board is automatically recognized at startup. The new version is automatically transferred to the channel board if the firmware differs. It can, therefore, take up to 15 minutes before the Channel-board is ready for operation.	

8.2.2 Removing a Channel Board

1. Turn the PAT-Tester-i-16 upright. Ensure the cover is closed and locked; otherwise, it may swing open and be damaged.	
2. Remove the two screws on the underside of the device.	
3. Now carefully tilt the underside downwards.	

4. Remove the four retaining screws at the corners of the channel board using a T10 Torx screwdriver. Make sure that no screws accidentally fall into the housing.	
5. Each channel board has a flat recess at the top and bottom. Insert a flat object, e.g., the corner of a plastic card, to carefully lever out the board.	

9 Storage and Disposal

9.1 Storage

The device may only be stored under the following conditions:

- dry and in a closed, dust-free room
- frost-free
- disconnected from the power supply

9.2 Disposal

The appliance must not be disposed of with regular household waste. Observe the applicable legal regulations. Do not hesitate to contact your dealer or the manufacturer for disposal.

10 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.