

# User Manual

Release 1.48

## **PAT-Cell-Press**

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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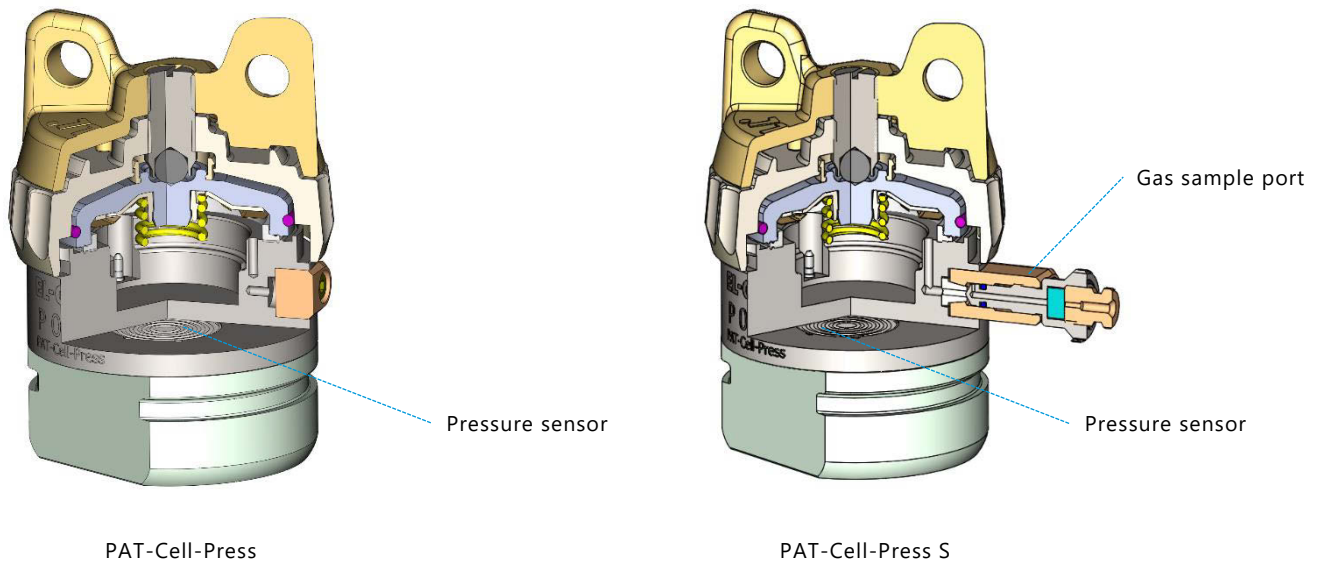
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## 1 Product description

The PAT-Cell-Press is a pressure test cell for measuring gas evolution during the electrochemical cycle. It is a cableless test cell using the PAT-Core concept. As an option, the PAT-Cell-Press is also available with a gas sample port for drawing gas.



### Features and specifications

- PAT-Core design with or without reference electrode
- Laser welded pressure sensor, pressure range of 0 to 3 bar abs (0.5 to 4.5 V)
- Optional gas sample port
- Dead volume with PAT-Core installed: 3.565 cm<sup>3</sup>
- Helium leak tested\*
- Can be used in single-channel configuration together with the PAT-Stand-1 in combination with the PAT-Press box and in the PAT-Tester-x.
- Can be used in multi-channel configuration in the PAT-Chamber-16 and PAT-Tester-i-16

\*The PAT-Cell-Press has been tested for leakage at the factory. For an empty cell, pressurized with air through the sample port by means of a syringe, at 2 bar absolute, at 50°C, the pressure decay after 24 hours is guaranteed to be less than 0.3 mbar per hour when using a PE seal, and less than 0.1 mbar per hour when using a PEEK seal.

## 2 Variants

### PAT-Cell-Press



PAT-Cell-Press

#### Features

- Laser welded pressure sensor, 0 to 3 bar abs

### PAT-Cell-Press S



PAT-Cell-Press S

#### Features

- Laser welded pressure sensor, 0 to 3 bar abs
- Gas sample port

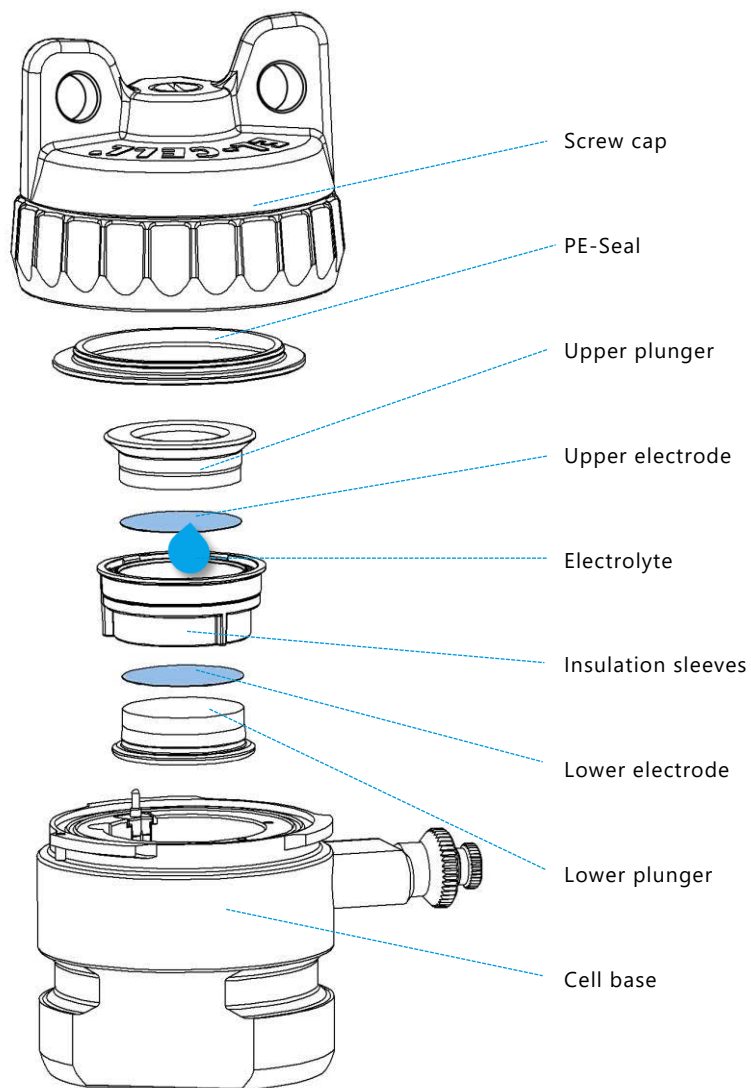
## 3 Safety precautions

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 disassembly. Upon cell disassembly, dispose all materials properly. Metallic lithium and some insertion compounds may decompose heavily in contact with water and other solvents, and can cause fire.

## 4 Assembly of the PAT-Cell-Press

This section describes how to assemble the PAT-Cell-Press test cell. A more detailed description of the PAT-Core can be found in a separate manual.

**Note:** The assembly has to take place under the protective atmosphere in a glove box.



1. Put the **insulation sleeve** onto the worktop with the smaller side pointing upwards. Different insulation sleeves are available for different test purposes, see chapters 6 and 7.
2. Insert the **lower electrode** into the sleeve with the active layer facing downwards.
3. Attach the **lower plunger**. The lower plunger is available in different gap sizes in order to account for the thickness of the electrodes and separator used, see chapters 6 and 7.
4. Turn the assembly upside down.
5. Align the contact spring of the sleeve with the horizontal contact pin inside the **cell base**. Then insert the assembly into the cell base.
6. Evenly dispense approx. 100  $\mu\text{L}$  of **electrolyte** 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** into the insulation sleeve with the active layer facing downwards.
8. Attach the **upper plunger**.
9. Attach the **screw cap** to the cell base with the wing nut fully released.
10. Tighten the wing nut clockwise in order to seal the cell

## 5 Disassembly and cleaning

When working with aprotic, moisture-sensitive electrolytes such as LiPF<sub>6</sub>, 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.

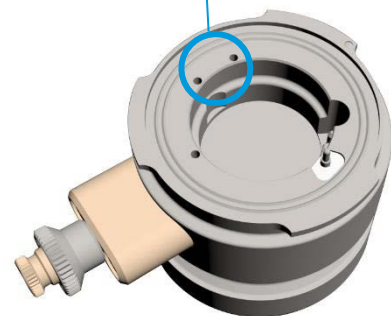
If the cell base or lid has been in contact with ambient air or if they are being used for the first time, they must be dried in a vacuum at 80°C for at least 12 hours before use.

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. The two adjacent holes at the top of the cell base (circled in the picture below) make connection to the laser welded pressure sensor located inside the lower part of the cell base. **In order to avoid corrosion, no liquids must enter these holes during cell assembly, cell operation and cleaning.** Refer to the troubleshooting section for help, if liquid did get into one of the holes.

Holes towards the stainless steel membrane of the laser welded pressure sensor. **Avoid contact with electrolyte or other liquids!**



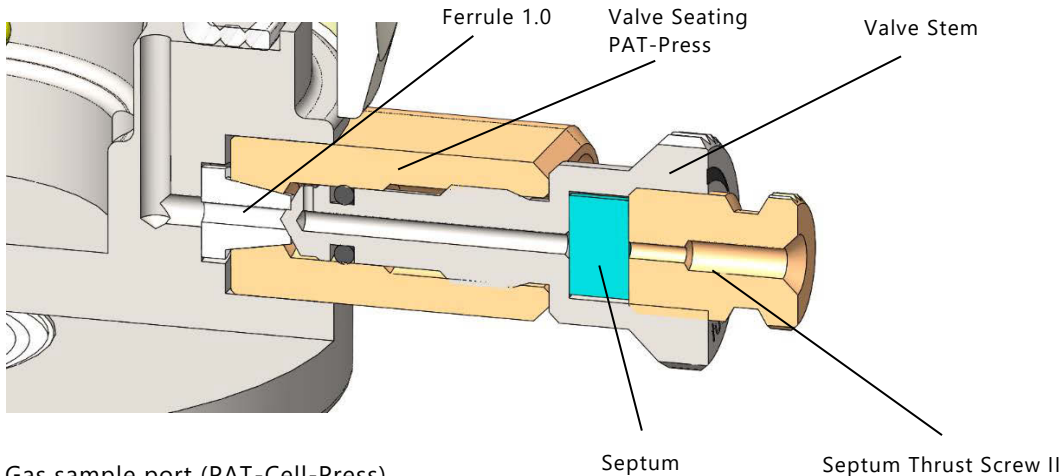
### Notes:

- Protect yourself against chemical hazards. Electrolytes may spill out during cleaning. Electrode materials and electrolytes may react with 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.



## 6 Sample valve with septum port (if installed)

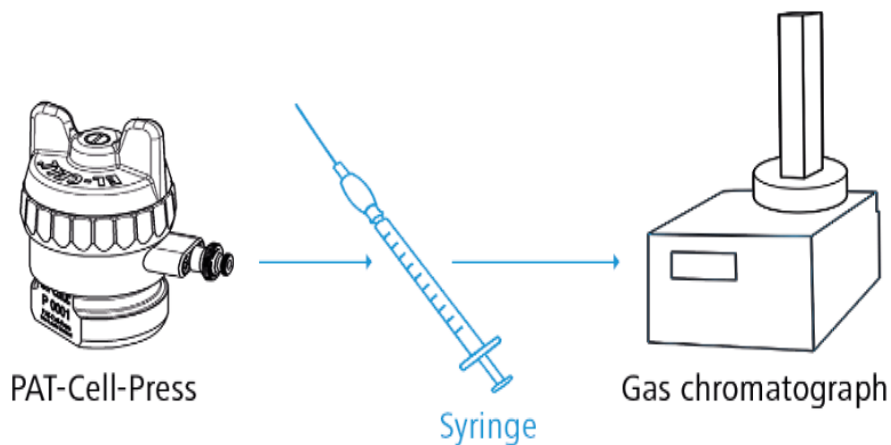
The gas sample valve serves to draw gas samples for further characterization from the head space of the test cell.



Gas sample port (PAT-Cell-Press)  
ECC1-00-0155-C

In the closed state, the valve spindle is seated on the PTFE ferrule and is thus preventing any bleeding through the pierced septum.

### 6.1 How to draw gas samples



1. Pierce the septum with a sample syringe appropriate for the subsequent gas analysis with e.g. a gas chromatograph. We recommend using a syringe with a pencil-point needle in order to prevent clogging when the septum of the sample port is pierced. A 1 ml syringe (LAB0024) and a pencil-point needle (LAB0039) are provided with the equipment.
2. Open the valve by turning the valve handle counter-clockwise by approx. 90 degrees
3. Fill the syringe by drawing back the syringe piston.
4. Close the valve by turning the valve handle clockwise till finger tight, and remove the syringe.

**Note:** Do not connect the sample port directly or permanently to an external device.

## 7 Unpacking

Check the contents of the packages 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-Press

- PAT-Cell-Press without PAT-Core

**Note:** The PAT-Cell-press is shipped with an inserted PE-Seal serving only as transport lock. Replace the sealing ring before putting the cell into operation.

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

- Sealing ring PE (10x) [ECC1-00-0232-A/X](#)

#### PAT-Cell-Press S

- PAT-Cell-Press without PAT-Core

**Note:** The PAT-Cell-press is shipped with an inserted PE-Seal serving only as transport lock. Replace the sealing ring before putting the cell into operation.

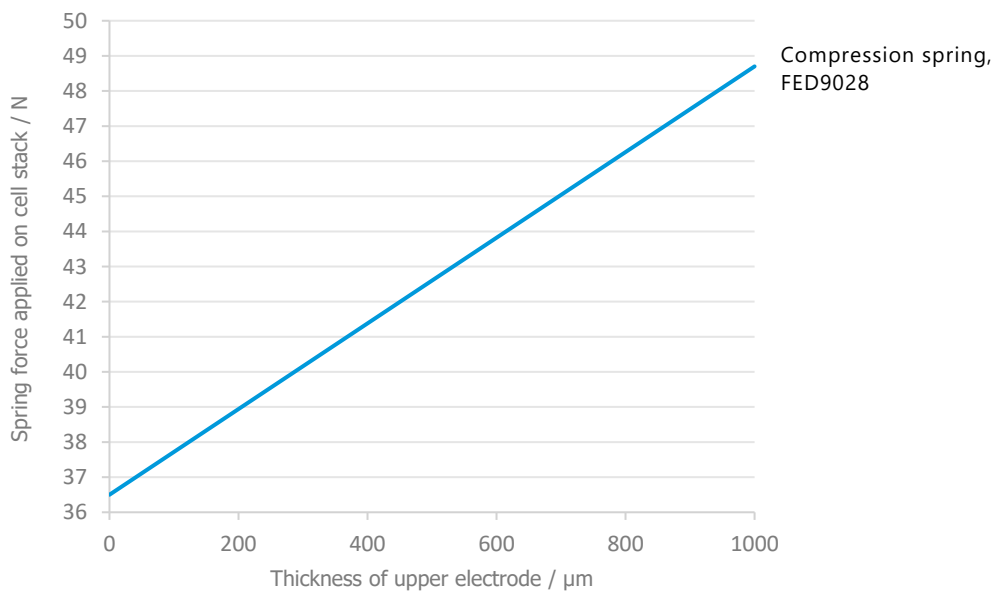
The components of the PAT-Core (insulation sleeves and plungers) must be purchased separately.

- Septum (10x) [ECC1-00-0097-B/X](#)
- Syringe 1ml (w/o Luerlock) [LAB0024](#)
- Spinal needle pencil-point (27g) [LAB0039](#)
- Sealing ring PE (10x) [ECC1-00-0232-A/X](#)
- Ferrule 1.0 (2x) [ECC1-00-0029-B/2](#)

## 8 Technical data

- Diameter: **49.5 mm**
- Height: **73 mm**
- Width: **70 mm / 49.5 mm** (with / without Sample port)
- Electrode diameter: **18 mm**
- Temperature operation range: **-20 to +80°C**
- Dead volume: **3.565ml / 8.144 ml** ( with inserted PAT-Core / without PAT-Core)

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

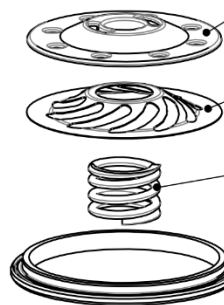
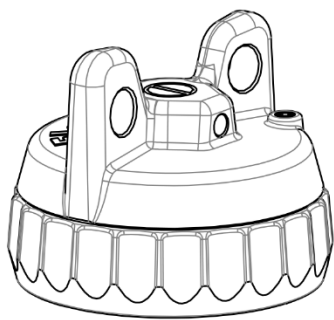
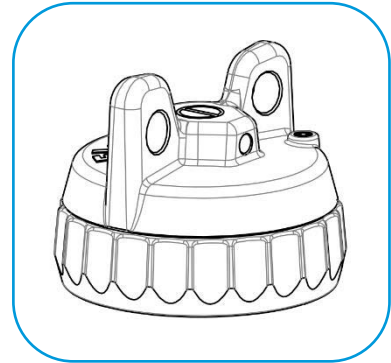


## 9 Consumables

- Sealing ring PTFE (10x) [ECC1-00-0232-B/X](#)
- Sealing ring PE (100x) [ECC1-00-0232-A/C](#)
- Sealing ring Al (10x) [ECC1-00-0232-G/X](#)

## 10 Spare parts

### Screw cap insulated (PAT), complete ECC1-00-0236-D



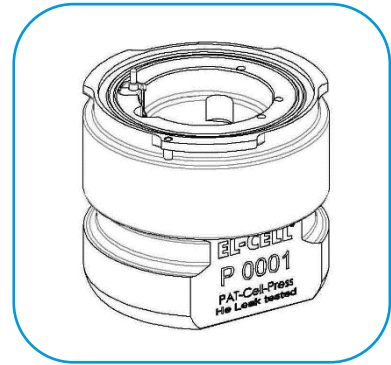
Lid inset (metal seal)  
ECC1-00-231-C

Disc Spring  
ECC1-00-0233-A

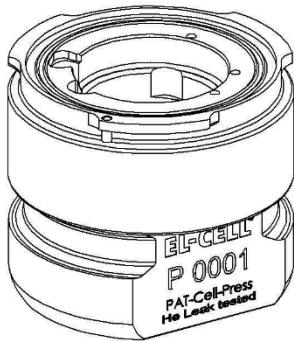
Compression Spring  
FED9028

Sealing ring

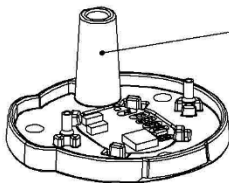
Cell base GTMS (PAT-Press), assy  
ECC1-00-0255-A



Spring contact pin holder, assy  
ECC1-00-0410-A



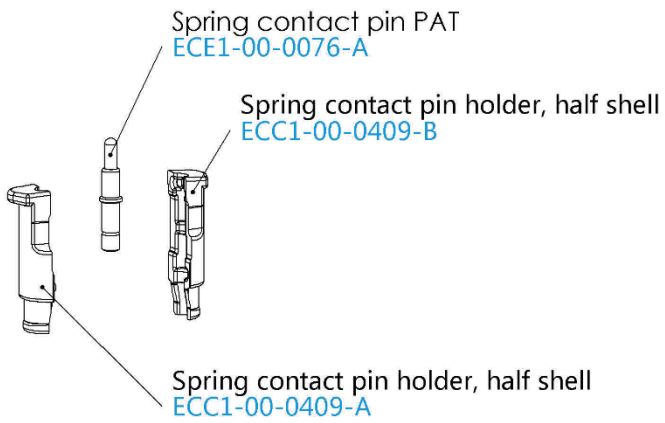
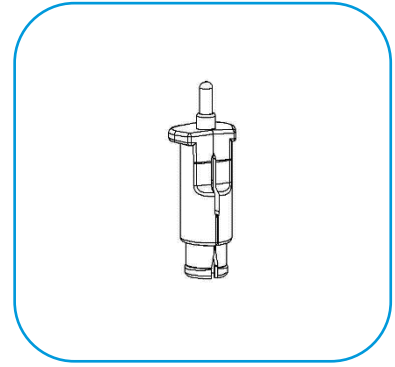
EEPROM holder, assy (PAT-Press)  
ECC1-00-0249-D



Countersunk screw  
DIN 965-M3x20 TX

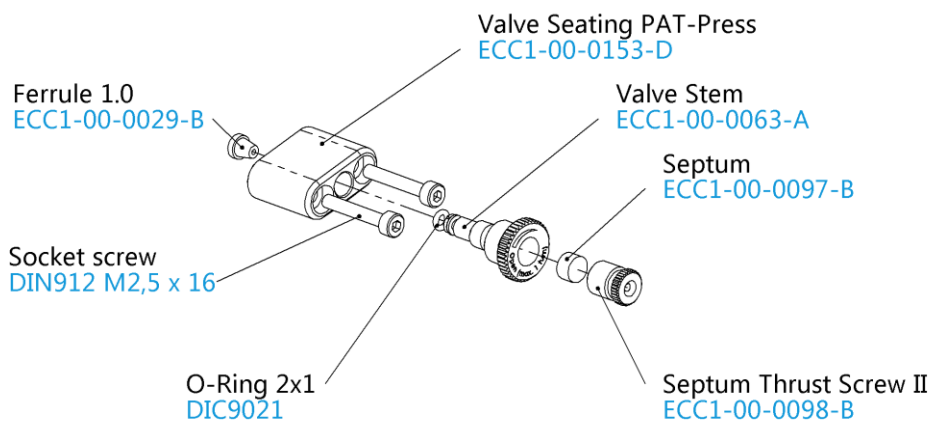
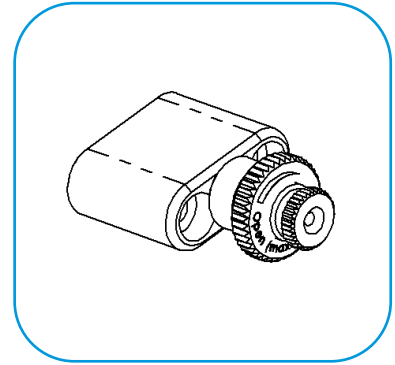
## Spring contact pin holder, assy

ECC1-00-0410-A



## Gas sample port (PAT-Press), assy

ECC1-00-0155-C



## 11 Troubleshooting

### What can I do if electrolyte has entered one of the holes in the cell base?

Please only attempt this in an emergency, as there is a risk of damaging the cell: Flush the holes with an appropriate solvent (e.g. distilled water) applying low pressure. Afterwards, the cell base should be dried out overnight at 80° C to remove liquid residues.

## 12 Technical support

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

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## 13 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.