

Translation of the original operating instructions

TC3000L

Large rigid test chamber for ELT3000

Catalog No.
600-101

From software version

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1 About this manual

1.1 Target groups

This instruction manual is intended for operators and technically qualified personnel with experience in leak detection technology and the integration of leak detectors in leak detection systems. In addition, the installation and use of the device require knowledge of electronic interfaces.

1.2 Warnings

 DANGER

Imminent hazard resulting in death or serious injuries

 WARNING

Hazardous situation resulting in potential death or serious injuries

 CAUTION

Hazardous situation resulting in minor injuries

NOTICE

Hazardous situation resulting in damage to property or the environment

1.3 Definition of terms

Minimum detectable leak rate

The minimum detectable leak rate that can be detected by the leak detector under ideal conditions ($< 1 \times 10^{-6}$ mbar l/s*).

* Helium equivalent leak rate for DMC with a pressure difference of 1000 mbar versus 0 mbar.

GCU

Gas Control Unit (basic unit, operating unit)

GDU

Gas Detection Unit

DMC

Dimethyl carbonate, typical solvent in battery electrolyte. CAS No. 616-38-6

MSDS

Material Safety Data Sheet

2 Safety

2.1 Intended use

The test chamber is designed for leak testing of Li-ion cells and Li-ion batteries. Uncharged cells/batteries can be tested safely. For testing charged cells/batteries, further safety measures must be taken to avoid personal injury and damage to property.

- For validation of the test, cells prepared as leaky are placed in the chamber. The preparation of the cells, which creates further hazards, is performed by the operator and is not an integral part of the test or the device. Testing of leaking cells will result in soiling of the test chamber and possibly "contamination". Cells to be tested with the test chamber must be pre-qualified. For this purpose, uncharged cells are examined, for example, to determine whether they can withstand the stresses of the leak testing. Suitable measures for the safety of man and machine must be taken by the operator.
- The test objects must be filled with an electrolyte in which one solvent component ideally consists of dimethyl carbonate (DMC, CAS No. 616-38-6).
- Depending on the internal structure of the test objects and the external geometries, local mechanical stresses can occur on the test objects. This can damage the test objects themselves, but also other components located in the test chamber.
- Make sure that the test chamber and the outer wall of the test objects are clean. Leak testing with charged test objects represents an additional safety risk and should only be carried out by appropriately trained personnel and with the installation of further safety measures.
- To avoid short circuits between the test object and chamber wall, use the insulator included in the scope of delivery.
- An external pump may optionally be connected to the ISO-KF16 connection according to the specifications in the documentation. The pump is not included in the scope of delivery. The pump capacity must be at least 40 L/min up to 1000 L/min. The optional external pump must be connected via an electrically switchable valve, a corrugated hose and, if required, a suitable adapter.

Incorrect usage

Avoid the following unintended uses:

- Testing of partially or fully charged cells and batteries without further safety measures.
- Use outside the technical specifications, see "Technical Data".
- Testing of non-vacuum Li-ion cells, batteries or other test objects.

- Testing of Li-Ion cells, batteries or other test objects that cannot withstand the stresses that occur during testing. Depending on the internal structure of the test objects and the external geometries, local mechanical stresses can occur on the test objects. This can damage the test objects themselves, but also other components in the test chamber.
- Testing of test objects whose current collectors can be short-circuited via the test chamber (e.g. via the lid or other conductive parts).
- Testing of test objects that come into contact with the sealing lips of the chamber.
- Testing of wet or moist test objects.
- Testing of test objects with significant temperature differences to the environment.
- Testing of damaged test objects, batteries or other test objects.
- Testing of test objects without insulator.
- Testing of components or substances other than lithium-ion batteries.
- Testing of contaminated test objects.
- Operation of a contaminated test chamber.
- Installation and operation in potentially explosive atmospheres.
- Installation and operation in locations with very low humidity.
- Operation of the chamber by inadequately trained personnel.
- Insufficient distance between the test objects in the test chamber.
- Use beyond the technical specifications.
- Use in radioactive areas.
- Closing the test chamber while your fingers are in the rotation range of the test chamber.
- Use of unauthorized accessories or spare parts.
- Mounting by untrained or unauthorized personnel. Only trained personnel or INFICON employees are permitted to carry out the assembly.
- Interchanging the exhaust air ("INLET") and supply air ("VENT") lines on the ELT3000.
- Pumping out liquids or vapors that can condense.
- Using an improperly dimensioned optional external pump.
- Use of the optional pump connection for abrupt venting.
- Testing of test objects that are too small or too light and may move uncontrollably during venting.
- Use of tools that may damage the sealing surfaces of the test chamber during mechanical cleaning.

This device is not intended to be used in residential areas and cannot ensure adequate protection of radio reception in such environments. The battery leak detector does not perform a safety function. In the event of strong electromagnetic interference, measured values could be falsified. It is recommended to check the function of the test chamber regularly (e.g. with a calibration leak).

2.2 Duties of the operator

- Read, observe, and follow the information in this manual and in the work instructions provided by the owner. This concerns in particular the safety and warning instructions.
- Always observe the complete operating instructions for all work.
- If you have any questions about operation or maintenance that are not answered in this manual, contact customer service.

2.3 Owner requirements

The following notes are for companies or any person who is responsible for the safety and effective use of the product by the user, employees or third parties.

Safety-conscious operation

- Only operate the test chamber and the battery leak detector if it is in technically perfect condition and shows no signs of damage.
- Only operate the test chamber and the battery leak detector as intended, in a safety-conscious and hazard-conscious manner and in compliance with these operating instructions.
- Provide ambient conditions that are suitable for operating staff, the test chamber and the test specimen.
- Adhere to the following regulations and observe their compliance:
 - Intended use
 - General applicable safety and accident prevention regulations
 - International, national and local standards and guidelines
 - Additional device-related provisions and regulations
- Only use original parts or parts approved by the manufacturer.
- Keep this instruction manual available on site.

Personnel qualifications

- Only allow instructed personnel to work with the test chamber and the battery leak detector. The instructed personnel must have received appropriate training. This includes knowledge of the dangers posed by leaking electrolyte/solvent.

- Make sure that authorized personnel have read and understood the instruction manual and all other applicable documents.

2.4 Dangers

The measuring instrument was built according to the state-of-the-art and the recognized safety regulations. Nevertheless, improper use may result in risk to life and limb on the part of the user or third parties, or damage to the unit or other property may occur.



WARNING

Danger to health due to hazardous materials and substances

Test specimens are usually filled with substances that are hazardous to health. If these substances leak during the test, they are freely accessible to the operator after the test.

- ▶ Wear appropriate protective clothing, especially gloves, gowns, and face shields.
- ▶ Ensure sufficient ventilation at the installation location.
- ▶ Avoid contact with skin, eyes, or clothing.
- ▶ Avoid inhaling these substances.
- ▶ Only test specimens for leak tightness that do not show any damage or smell of electrolyte or solvent after initial inspection.
- ▶ Before removing the test specimen (visual check and smell test), check whether any contents of the test specimen have leaked out.
- ▶ Pay attention to the risks posed by released electrolyte components and their reaction products.
- ▶ Defective test specimens can develop gross leaks during the leak testing. In the case of test specimens with gross leaks, observe the company's internal regulations for handling electrolyte and the safety instructions in the safety data sheets.
- ▶ Do not pump out toxic or corrosive gases.
- ▶ Clean the device regularly and keep it clean at all times.
- ▶ Observe the safety instructions in the safety data sheets for the test objects.
- ▶ Operate the device only with a connected exhaust air connection and in well-ventilated rooms. Alternatively, the device may be used in rooms where hazardous substances under test are monitored.
- ▶ When nitrogen or argon is used as a purge gas, it can cause asphyxiation at dangerous room concentrations. Suitable measures must be taken. The pressure in the gas line to the purge gas connection must not exceed 100 mbar over atmospheric pressure. An exhaust gas line must be connected.

**⚠ WARNING****Fire and explosion hazard**

Reaction products during combustion can lead to further health risks.

- ▶ Do not operate the device unattended.
- ▶ Only operate the device with the exhaust hose connected.
- ▶ Do not pump off explosive gases.

**⚠ CAUTION****Warning about hand injuries**

Danger of crushing by opening the flap if the clearance is too small at the top and rear.

Danger of crushing when closing the test chamber lid in the gap between the test chamber lid and the test chamber, or between the test chamber rings.

- ▶ Ensure that there is sufficient space where the devices are located, see also "Setup".
- ▶ Only open and close the test chamber when your fingers are outside the test chamber halves and outside the pivoting range of the test chamber.
- ▶ Do not touch the hinge when closing the test chamber.

**Measurement inaccuracies due to dirty test chamber**

Escaping electrolyte can contaminate the test chamber.

- ▶ After detecting leakage, check the test chamber for contamination caused by escaping electrolyte.
- ▶ Avoid inhaling harmful gases or vapors.
- ▶ Keep the gasket of the test chamber clean. Do not use grease or lubricants.
- ▶ Remove coarse soiling with a dust-free cloth. This soiling can falsify the measurement results. The device features a purging function which can be carried out in case of minor soiling, see ELT3000 instructions "Purging the device". Use personal protective equipment.

3 Scope of delivery, transport

Scope of delivery	Item	Quantity
	Test chamber TC3000L	1
	Operating instructions	1
	Insulator	1
	Inline Filter	1
	"VENT" hose	1
	"INLET" hose	1
	Angle clips	12

- ▶ Check the scope of delivery after receipt of the product to make sure it is complete and it has no visible damage.

Transport

NOTICE

Damage caused by transport

Transport in unsuitable packaging material can damage the device.

- ▶ Keep the original packaging.
- ▶ Only transport the device in its original packaging.

4 Description

TC3000L overview

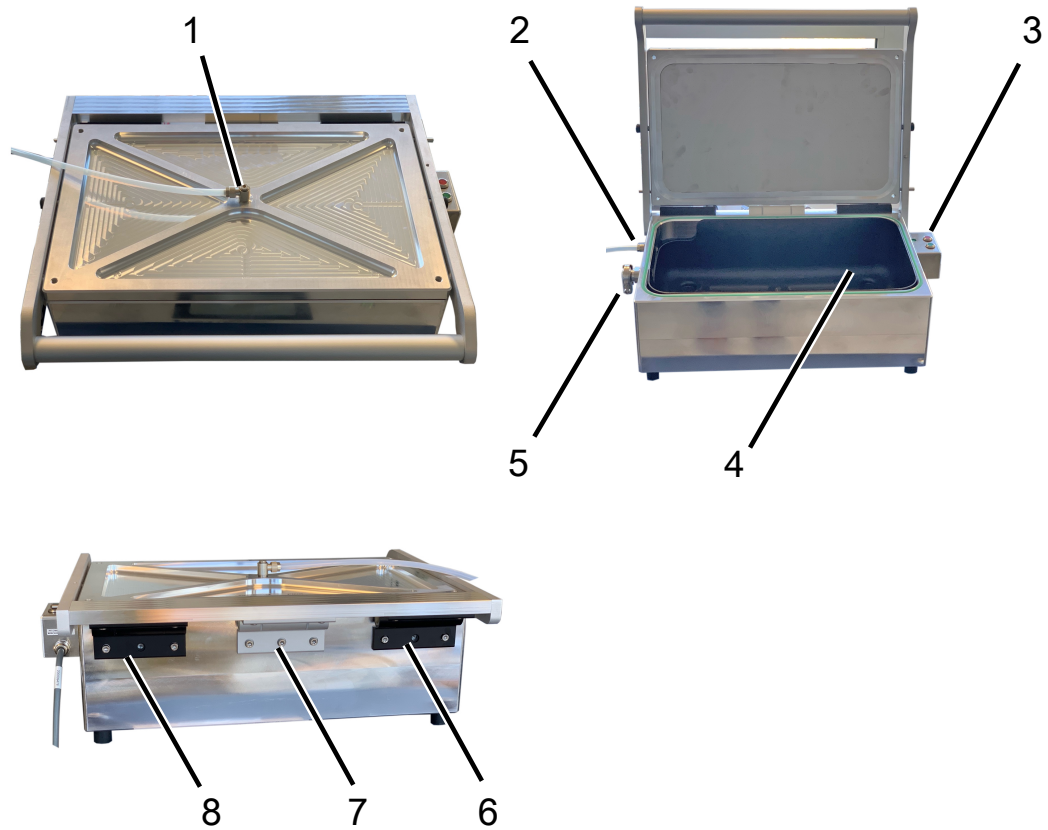


Fig. 1: TC3000L

1	"INLET" connection	5	Connection for optional auxiliary pump
2	"VENT" connection	6	Hinge (spring-mounted)
3	Proximity switch with red-green display (for automatic measurement start)	7	Hinge (dampened)
4	Insulator	8	Hinge (spring-mounted)

4.1 Function

The test chamber, in conjunction with the Gas Control Unit of the ELT3000, makes it possible to perform leak testing on test objects. Test objects that are not vacuum-tight can thus be tested for leak tightness.

Place the test object in the test chamber. By pumping out the air from the test chamber, a pressure gradient between test object and test chamber is generated.

Due to this pressure gradient, gas flows through leakages out of the test object and into the test chamber. This gas is sent to the GDU (Gas Detection Unit) for analysis.

After the analysis, the result is compared with the setpoint. A distinguishable leak-proof/leaky signal is output.

4.2 Markings on the device

The markings on the device have the following meanings:



Device cannot be disposed of as normal domestic waste.



Note: Only put objects that are obviously undamaged and vacuum-tight in the device.



Warning about hand injuries



Read operating instructions

4.3 Technical data

Mechanical data

Dimensions (L × W × H)	420mm x 550mm x 200mm
Installation depth	600 mm
Weight	17.0 kg

Electrical data

Operating voltage	24V DC
Power consumption	5 VA

Physical data

Pressure range	1080 hPa to 1 hPa
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Ambient conditions

Temperature range (°C)	10 °C to 40 °C
Relative humidity (%)	80 % at 30 °C, linear decrease to 50 % at 40 °C
Height above sea level (m)	2000 m
Degree of contamination	II

5 Installation

WARNING

Risk of injury from escaping electrolytes

- ▶ Make sure that you do not incorrectly swap the vent line and the inlet line when connecting the lines on the ELT3000 battery tester.

CAUTION

Risk of injury from falling or tipping device

If the device slips off its surface, it can fall down and crush your feet.

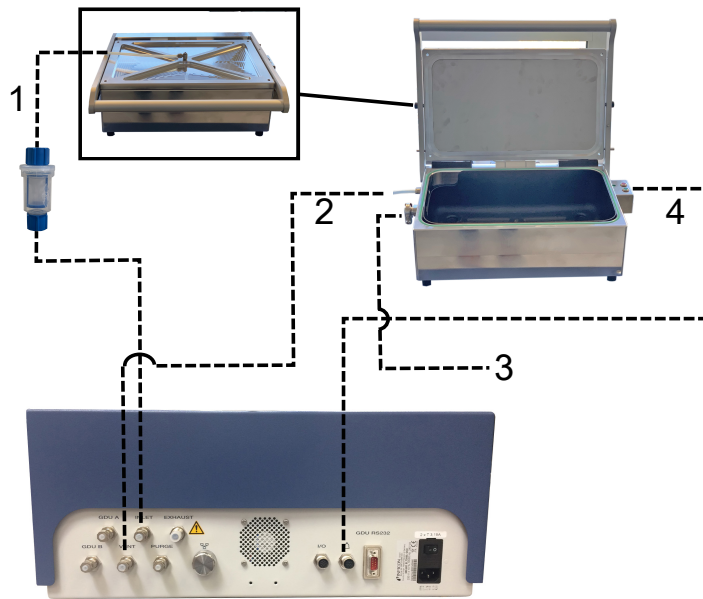
- ▶ Only place the test chamber on a clean, horizontal, non-slip and vibration-free surface.
- ▶ The recommended installation height of the chamber is 27.6 - 35.4 in. (70 - 90 cm). The choice of the best ergonomic installation height is the responsibility of the owner.
- ▶ Do not place the test chamber on the gas control unit.
- ▶ Use non-slip rubber bumpers for the device feet.

NOTICE

Property damage due to improper installation

It is recommended to have the installation carried out by INFICON or by trained personnel.

Installation scheme



1	"INLET" connection	3	External pump connection (optional)
2	"VENT" connection	4	Proximity switch connection

Connecting an external pump (optional)

⚠ CAUTION

Uncontrolled movements of chamber lid or test objects

An incorrectly selected or incorrectly connected external pump can lead to hazards from the lid or test objects, which can move uncontrollably due to excessive air flows.

- ▶ Only use an external pump that complies with the permitted technical data.
- ▶ When installing and commissioning an external pump, be sure to follow the instructions below.

To increase the pumping capacity, you can connect an external pump to the ISO-KF16 connection. The ISO-KF16 connection is closed with a blind flange when delivered. To do this, connect an electrically switchable valve with a minimum nominal diameter of DN4 to the ISO-KF16 connection. The valve must be suitable for a pressure range of at least 0 to 1.5 bar (absolute). This enables the external pump to be switched on and off later. When using an IO1000 module connected to the ELT3000, the valve can be switched via one of the PLC outputs. Please note that the valve is switched with 24V, with a maximum current consumption of 0.75 A. You can connect a suitable pump to the valve via a corrugated hose and adapter. For this

purpose, we recommend the use of a single-phase, dry vacuum pump with a pumping capacity of at least 40 L/min (up to 1000 L/min). The external pump is not operated via the ELT3000, but must be permanently operated externally.

6 Operation

WARNING

Risk of injury from explosion

If both battery poles come into contact with the electrically conductive test chamber, a short circuit and thus high temperatures can occur in the tested battery.

- ▶ Do not perform a battery test without the original insulator.
- ▶ Make sure that the battery connections do not touch the test chamber cover.
- ▶ Only test vacuum-tight and obviously undamaged battery cells in this test chamber.
- ▶ Make sure that there is no material in the test chamber that could damage the battery (e.g. pointy, sharp objects).
- ▶ Leave batteries in the chamber only for the test period, and not permanently.
- ▶ Keep the test chamber clean and clean it regularly.
- ▶ No smoking.
- ▶ Keep ignition sources away from the test chamber.

WARNING

Respiratory tract irritation

The solvents in lithium-ion batteries can cause respiratory irritation and loss of consciousness if they leak from the battery.

- ▶ To avoid irritating your airways, avoid contact with electrolytes.
- ▶ Only place vacuum-tight and obviously undamaged battery cells in this test chamber.

WARNING

Damage to battery cells due to pointed foreign objects

Pointed foreign bodies can penetrate battery cells during the test procedure and trigger a short circuit.

- ▶ Make sure that the test chamber is always free of pointed foreign bodies.



CAUTION

Warning about hand injuries

- ▶ Only open and close the test chamber when your fingers are outside the pivoting range of the test chamber.

⚠ CAUTION**Danger due to physical stress / ergonomics**

Continuous opening and closing of the test chamber cover can result in fatigue of the arm muscles.

Incorrect setup of the test chamber can impair its moving parts.

- ▶ Plan enough breaks to avoid fatigue.
- ▶ Set up the test chamber so that there is no impairment of its moving parts.
 - ⇒ When setting up the test chamber, pay attention to the height and distance from the operator.
 - ⇒ Pay attention to the arrangement of the test object trays.
- ▶ Do not lean on the handle of the test chamber.
- ▶ If a sudden change in opening or closing forces is observed while operating the chamber, check all hinges immediately and replace if necessary.

NOTICE**Property damage due to accumulation or blockage in detachable parts with solvents**

Accumulation or blockage in detachable parts due to solvents lead to functional problems.

- ▶ Replace the particle filter as needed or annually.
- ▶ Replace all gaskets and hoses as necessary, otherwise annually.

6.1 Carrying out leak testing

This test chamber is used to perform leak tests on vacuum-tight and undamaged test objects (lithium-ion batteries).

- ✓ The test chamber and Gas Control Unit are properly connected, see also "Installation".
- ✓ The Gas Control Unit is switched on. The two LEDs flash simultaneously during startup.
 - 1** Place the test object in the test chamber.
 - 2** By closing the cover you actuate the proximity switch and the measurement is started.
 - ⇒ The air is pumped out of the test chamber.
 - ⇒ After the analysis, the result is compared with the setpoint and shown on the display of the Gas Control Unit.
 - ⇒ The red LED lights up when a leak greater than the configured setpoint has been detected.
 - ⇒ The green LED lights up when a leak less than the configured setpoint has been detected.
 - 3** You can now open the lid and remove the test object. Skin contact with electrolytes when cleaning the test chamber or removing leak-tested test objects should be avoided.

7 Cleaning and maintenance

WARNING

Burns to the skin

Leaking batteries can release electrolyte, which in combination with water becomes hydrofluoric acid and is highly corrosive.

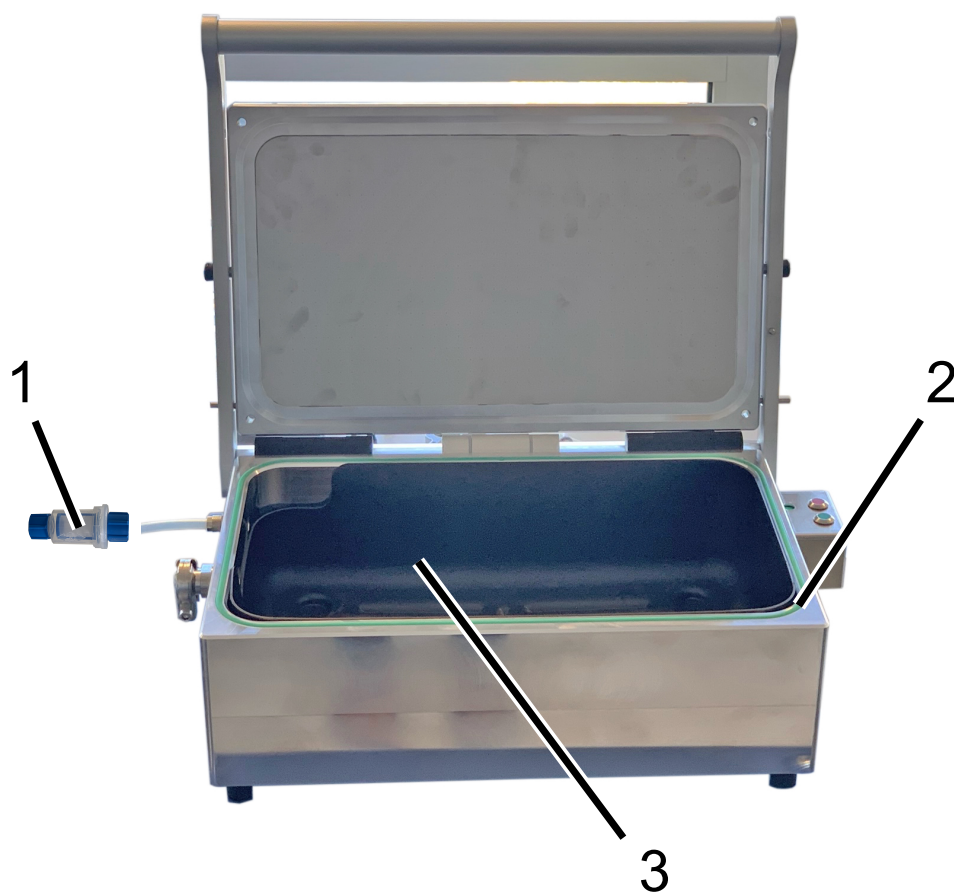
- ▶ Carefully remove minor, visible contamination of the test chamber with alcohol.
- ▶ Avoid contact with the electrolyte.
- ▶ Before sending the test chamber to INFICON Service, fill in a contamination declaration, also see "Sending in the device [▶ 23]". INFICON Service then decides whether the test chamber must be sent to a decontamination center beforehand.

CAUTION

Risk of injury from contamination

Crystalline deposits or liquids in the system pose an increased risk of contamination.

- ▶ Always wear personal protective equipment during maintenance work.



1	Particle filter	2	O ring
3	Insulator		

Particle filter

- ▶ Replace the particle filter annually or as needed, e.g. noticeable solvent accumulation or blockage.

O ring

- ▶ Replace the O-ring of the test chamber in case of functional problems and external damage.

Insulator

- ▶ Replace the insulator in case of mechanical damage and wear.

8 Sending in the device



WARNING

Danger due to harmful substances

Contaminated devices could endanger health. The contamination declaration serves to protect all persons who come into contact with the device.

► Fill in the declaration of contamination completely.

- 1 Contact the manufacturer and send in a completed declaration of contamination before return shipment.
⇒ You will then receive a return number and a shipping address.
- 2 Use the original packaging when returning.
- 3 Before sending the device, attach a copy of the completed contamination declaration.

8.1 Disposal

Disposal of test chamber

The test chamber as an accessory can be disposed of by the operator or sent to the manufacturer. The test chamber consists of materials that can be recycled. This option should be exercised to prevent waste and also to protect the environment.

During disposal, observe the environmental and safety regulations of your country.



The test chamber cannot be disposed of as normal domestic waste.

9 Declaration of Contamination

Declaration of Contamination

The service, repair, and/or disposal of vacuum equipment and components will only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay.
 This declaration may only be completed (in block letters) and signed by authorized and qualified staff.

1 Description of product

Type _____

Article Number _____

Serial Number _____

2 Reason for return

3 Operating fluid(s) used (Must be drained before shipping.)

4 Process related contamination of product:

toxic	no <input type="checkbox"/> 1)	yes <input type="checkbox"/>	
caustic	no <input type="checkbox"/> 1)	yes <input type="checkbox"/>	
biological hazard	no <input type="checkbox"/>	yes <input type="checkbox"/> 2)	
explosive	no <input type="checkbox"/>	yes <input type="checkbox"/> 2)	
radioactive	no <input type="checkbox"/>	yes <input type="checkbox"/> 2)	
other harmful substances	no <input type="checkbox"/> 1)	yes <input type="checkbox"/>	

2) Products thus contaminated will not be accepted without written evidence of decontamination!

The product is free of any substances which are damaging to health
 yes

1) or not containing any amount of hazardous residues that exceed the permissible exposure limits

5 Harmful substances, gases and/or by-products

Please list all substances, gases, and by-products which the product may have come into contact with:

Trade/product name	Chemical name (or symbol)	Precautions associated with substance	Action if human contact

6 Legally binding declaration:

I/we hereby declare that the information on this form is complete and accurate and that I/we will assume any further costs that may arise. The contaminated product will be dispatched in accordance with the applicable regulations.

Organization/company _____

Address _____ Post code, place _____

Phone _____ Fax _____

Email _____

Name _____

Date and legally binding signature _____ Company stamp _____

Copies:
 Original for addressee - 1 copy for accompanying documents - 1 copy for file of sender

10 Declarations of Conformity



EU Declaration of Conformity

We – INFICON GmbH - herewith declare that the products defined below meet the basic requirements regarding safety and health, and relevant provisions of the relevant EU Directives by design, type and the versions, which are brought into circulation by us. This declaration of conformity is issued under the sole responsibility of INFICON GmbH.

In case of any products changes made without our approval, this declaration will be void

Designation of the product:

**Chamber for battery leak detector
as interchangeable equipment for
Battery leak detector ELT3000**

Models: **TC3000L**

Catalogue numbers:

BETA 200011082

Authorised person to compile the relevant technical files:

Heinz Rauch, INFICON GmbH, Bonner Strasse 498, D-50968 Cologne

Cologne, December 09th, 2021

H. Bruhns, Vice President LDT

The products meet the requirements of the following Directives:

- *Directive 2006/42/EC (Machinery)*
- *Directive 2014/30/EU (EMC)*
- *Directive 2011/65/EC (RoHS)*

Applied harmonized standards:

- *EN ISO 12100:2010*
- *EN 61326-1:2013*
Class A according to EN 55011:2016+A1:2017
- *EN IEC 60204-1:2016*
- *EN IEC 63000:2018*

Cologne, December 09th, 2021

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UK Declaration of Conformity

We – INFICON GmbH - herewith declare that the products defined below meet the basic requirements regarding safety and health, and relevant provisions of the relevant legislation by design, type and the versions, which are brought into circulation by us. This declaration of conformity is issued under the sole responsibility of INFICON GmbH.

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Catalogue numbers:

BETA 200011082

Authorised person to compile the relevant technical files:
Heinz Rauch, INFICON GmbH, Bonner Strasse 498, D-50968 Cologne

Cologne, December 9th, 2021

H. Bruhns, Vice President LDT

The products meet the requirements of the following Directives:

- **S.I. 2008 No. 1597 (Machinery)**
- **S.I. 2016 No. 1091 (EMC)**
- **S.I. 2012 No. 3032 (RoHS)**

Applied harmonized standards:

- **EN ISO 12100:2010**
- **EN 61326-1:2013**
Class A according to EN 55011:2016+A1:2017
- **EN IEC 60204-1:2016**
- **EN IEC 63000:2018**

Cologne, December 9th, 2021

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