

USER MANUAL

Solid-State Battery Test Mold with Locking Ring

Compact split-cell die with a PEEK inner core and an upper locking ring for quick, even pressure release — built for frequent sample changes and glovebox operation



MOL1B100A — solid-state battery test mold with upper locking ring (complete assembly)

Model No.	MOL1B100A
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Read this manual completely before operating the MOL1B100A mold. Keep it near the instrument for quick reference. Specifications and instructions are subject to change without notice — check www.labcorematerials.com for the latest revision.

01 Chapter 1 Overview

1.1 Product Description

The LabCore MOL1B100A is an upgraded compact split-cell mold for solid-state battery research. Building on the proven PEEK-core compact design, it adds an upper locking ring that enables quick, even pressure release and safer disassembly — a practical advantage when samples are changed frequently and when most of the workflow happens inside a glovebox, where a stuck pellet or a jammed plunger costs the most time.

The mold body pairs a PEEK inner core — chosen for its electrical insulation, chemical resistance and mechanical stability up to 200 °C — with die-steel plungers and alloy-steel structural parts. Three pressing bolts with return springs carry the stack force; backing off the upper locking ring lets the springs lift the top plate and release the pressure quickly and evenly. The standard $\varnothing 10$ mm cavity covers the most common lab sample sizes, and the compact $\varnothing 70 \times H93$ mm footprint fits comfortably inside gloveboxes and environmental chambers.

Pressure capability is 500 MPa standard (4 T stack force over the $\varnothing 10$ mm cavity), with a 1000 MPa configuration available for high-stack-pressure studies. A Working/Counter electrode configuration covers assembly and testing of two-electrode all-solid-state cells, and the integrated insulation and positioning design reduces assembly errors during repetitive, high-throughput workflows.

1.2 Key Features

1. **Upper locking ring with quick release.** The knurled ring engages the core to pre-tighten and retain the stack; backing it off releases the pressure quickly and evenly, and allows safer disassembly — especially valuable for high-frequency sample changes and glovebox operation.
2. **PEEK inner core.** Outstanding electrical insulation, chemical resistance and mechanical strength up to 200 °C, protecting both the sample and the cell hardware.
3. **Compact footprint.** $\varnothing 70$ mm $\times$ H93 mm body with a standard $\varnothing 10$ mm working cavity — fast sample loading and electrode swapping inside a glovebox.
4. **High-pressure ready.** 500 MPa standard; a 1000 MPa configuration is available on request for high-stack-pressure studies.
5. **Humanized insulation and positioning design.** Indexed parts reduce assembly errors during repetitive, high-throughput workflows.

1.3 Standard Components

Each MOL1B100A is supplied as a complete assembly. Figure 1.1 shows the assembled mold; Figure 2.1 shows the exploded view of all parts, and Chapter 2 explains the function of each component.



Figure 1.1 – MOL1B100A solid-state battery test mold with locking ring, assembled (product view)

02 Chapter 2 Main Structure

The mold uses a compact split-cell architecture built around a PEEK inner core. An alloy-steel top plate and base are connected by three pressing bolts; return springs sit on the bolts between the plates. The knurled upper locking ring engages the core, pre-tightens the stack and retains the force; when it is backed off, the return springs lift the top plate and release the pressure quickly and evenly. Die-steel upper and lower plungers close on the $\varnothing 10$ mm cavity, and fluoroelastomer (FKM) seal rings seal it against air and moisture for glovebox work. Integrated insulation and positioning features keep repetitive assembly consistent and error-free.

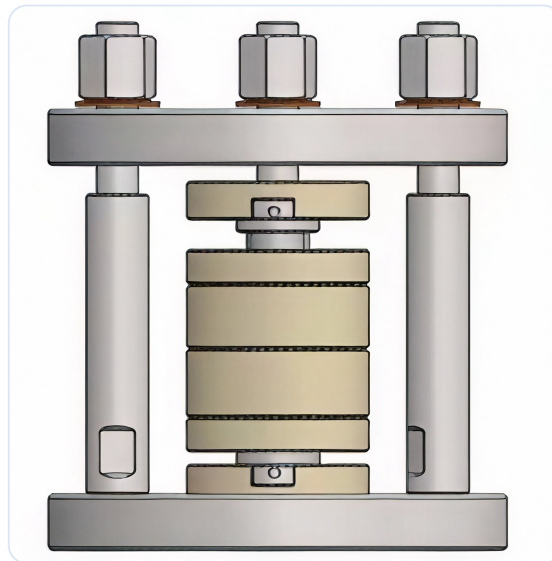


Figure 2.1 – Exploded view of the MOL1B100A: top plate, pressing bolts with return springs, upper locking ring, plungers and PEEK inner core

2.1 Component List

1. **Top plate and base** – alloy-steel end plates; transmit the press load into the pressing stack.
2. **Three pressing bolts with return springs** – carry the stack force; the springs give fast, even release as soon as the bolts are loosened.
3. **Upper locking ring** – knurled ring engaging the core; pre-tightens the stack, retains the force and enables quick pressure release and safe disassembly.
4. **Upper punch assembly** – die-steel plunger, closes the cavity and transmits the stack force to the powder.
5. **Lower punch assembly** – die-steel plunger, supports the powder stack and ejects the pellet.
6. **PEEK inner core** – $\varnothing 10$ mm working cavity; electrical insulation and chemical resistance.
7. **FKM seal rings** – cavity sealing against air and moisture.
8. **Insulation and positioning features** – indexed, electrically isolated parts that reduce assembly errors.
9. **Accessories** – loading tools and spares.

03 Chapter 3 Main Specifications

3.1 Basic Parameters

Model	MOL1B100A
Ordering SKU	MOL1B100A-STD-1P (Standard, 1 pc)
Working cavity diameter	φ10 mm – customizable 5–20 mm on request
Mold outer dimensions	φ70 mm × H93 mm
Screw head diameter	36 mm
Core material	PEEK
Plunger material	Die steel
Electrode configuration	Working / Counter
Maximum stack force	4 T (≈ 500 MPa over the φ10 mm cavity)
Maximum pressure	500 MPa standard / 1000 MPa optional
Maximum operating temperature	200 °C
Special feature	Upper locking ring with quick pressure release
Application	Solid-state battery research, high-frequency sample screening, glovebox operation, in-situ EIS, long-term cycling

3.2 Component Details

Frame & plates	Top plate, base	Alloy steel
Pressing hardware	Three pressing bolts with return springs	Alloy steel
Quick release	Upper locking ring	Knurled; engages the PEEK core
Molding parts	Upper punch, lower punch	Die steel
Cavity core	PEEK inner core	φ10 mm bore
Sealing	FKM seal rings	Fluoroelastomer

NOTE

Custom cavity diameters (5–20 mm) and the 1000 MPa high-pressure configuration are available on request. Standard lead time is 3 business days. Contact business@labcorematerials.com with your target material system and pressure range.

04 Chapter 4 Operation Guide

4.1 Operating Steps

Read Chapter 7 carefully before starting. Steps that involve exposed powder should be performed inside a glovebox where your material system requires it.

1. **Inspection.** Check that all components are clean, dry and undamaged; verify that the seal rings are fully seated in their grooves.
2. **Base assembly.** Insert the lower punch into the PEEK core bore, then place the core assembly on the base.
3. **Powder loading.** Weigh the powder, pour it into the $\varnothing 10$ mm cavity, and level the bed so that it is even.
4. **Closing.** Insert the upper punch and align it with the cavity, then set the top plate over the three pressing bolts.
5. **Bolt engagement (pre-tighten).** Thread the three pressing bolts into the base evenly, in turn, so the top plate stays parallel to the base.
6. **Locking-ring engagement.** Thread the knurled upper locking ring onto the core until the stack is snug and the plunger gap is closed.
7. **Pressing.** Place the mold at the centre of the platen and raise the pressure gradually to the target stack force (do not exceed 4 T) and hold for the required dwell time.
8. **Force retention (optional).** With the load still applied, tighten the upper locking ring fully – the mold can then be removed from the press while staying loaded.
9. **Quick pressure release.** Back off the upper locking ring: the return springs lift the top plate and release the pressure quickly and evenly. Only then loosen the three pressing bolts.
10. **Demolding.** Open the stack and retrieve the pellet with non-metallic tweezers.
11. **Cell assembly / testing.** Proceed with cell assembly or ionic-conductivity testing in the same fixture as your protocol requires.
12. **Cleaning.** Clean and dry all components immediately after use (see Chapter 6).

NOTE – PRESSURE RAMP

Avoid rapid pressure ramping. Raise the force gradually and hold at the target value; sudden load steps cause uneven density and cracked pellets.

NOTE – LOCKING-RING RELEASE

Never loosen the three pressing bolts while the stack is under load. Always release the pressure through the upper locking ring first, and keep hands clear of the top plate when the springs lift it. If the ring is hard to turn, stop and check the threads – never force it.

4.2 Pellet Acceptance Check

After pressing, the pellet is considered good when all of the following are satisfied:

- The pellet is flat, dense and free of cracks or edge chipping.
- Thickness is uniform across the pellet area.
- For an assembled cell, a multimeter check shows no short circuit between the upper and lower punches (electrodes).

05 Chapter 5 Troubleshooting

The table below lists the most common operating problems and their corrective actions.

1	Uneven or cracked pellet	• Ensure homogeneous powder filling and level the powder bed before pressing. • Raise the pressure gradually and optimise the dwell time; avoid rapid ramping. • Re-tighten the three pressing bolts evenly so the top plate stays parallel.
2	Pellet stuck in the cavity / difficult demolding	• Press the lower punch out slowly and evenly; never pry the pellet with metal tools. • Check the core bore for burrs or residue and clean it with anhydrous ethanol.
3	Locking ring stiff or hard to turn	• Clean the ring and core threads; cross-threading or residue is the most common cause. • Align the ring squarely with the core before threading; never force it under load.
4	Sealing degraded / moisture ingress	• Inspect the FKM seal rings for ageing, swelling or nicks and replace them as a set. • Keep the mold dry and store it cleaned and unloaded.
5	Uneven or slow pressure release	• Check the return springs and bolt threads for deformation, scoring or debris. • Loosen the three bolts evenly, a little at a time, after the locking ring has been backed off.

06 Chapter 6 Maintenance

6.1 Routine Maintenance

1. **Component cleaning.** Wipe all components with a soft cloth or cotton swabs and anhydrous ethanol. Pay special attention to the cavity bore, the seal-ring grooves, the locking-ring threads and the bolt threads.
2. **Wear inspection.** Check the punches, core bore, seal rings, locking-ring threads and return springs for deformation, scoring or damage.
3. **Dry storage.** Store all fully dried components in a dust-free environment.

6.2 Periodic Maintenance

1. **Seal-ring replacement.** Replace the FKM seal rings as a set when swelling, ageing or visible damage appears.
2. **Rust prevention.** Anti-rust oil may be applied to the die-steel plungers, bolts and threads. Wipe off all anti-rust oil completely before the next use.
3. **Impact handling.** The PEEK inner core has good wear resistance but limited impact resistance. Handle all parts with care.

STORAGE

Keep the mold assembled but unloaded when stored. Do not leave electrolyte or electrode residues inside the cavity – clean and dry the mold immediately after every experiment.

07 Chapter 7 Safety Precautions

WARNING

Do not exceed the maximum stack force of 4 T (≈ 500 MPa over the $\phi 10$ mm cavity). Overloading will cause permanent structural damage to the mold and may eject parts at high velocity.

1. **Load limit.** Do NOT exceed the maximum stack force of 4 T, or permanent structural damage may occur.
2. **Temperature limit.** Do not operate above 200 °C in order to prevent polymer ageing of the PEEK core.
3. **Centred mounting.** Always place the mold at the centre of the press platen to avoid offset loading.
4. **Release safety.** Never loosen the pressing bolts under load – release the pressure through the upper locking ring first, and keep hands clear of the top plate.
5. **Personal safety.** Wear safety goggles during operation to prevent pinch injury or material splashing.
6. **Material limitation.** The PEEK core and FKM seal rings have definite pressure and temperature limits. Operate strictly within the rated specifications.
7. **Intended use.** This LabCore precision mold is a special-purpose laboratory instrument and shall not be used for non-laboratory applications.

Technical support

Questions about operation, custom cavity sizes (5–20 mm) or the 1000 MPa high-pressure configuration?
business@labcorematerials.com.

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