

USER MANUAL

Single-Point Pressing Solid-State Battery Test Mold

Single-point axial pressing split-cell die with a PEEK-ceramic composite core and a dual-seal structure for solid-state battery research – Standard and With-Sensor variants



MOL5B100A – single-point pressing solid-state battery test mold

Model No. **MOL5B100A**

Document No. **UM-MOL5B100A**

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Empowering Battery Research Worldwide

Solid-State · Lithium-Ion · Sodium-Ion · Next-Gen

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Read this manual completely before operating the MOL5B100A 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 MOL5B100A is a compact single-point pressing mold developed for laboratory sample preparation in solid-state battery and new-energy materials R&D. The mold applies stack force along a single central axis through the $\varnothing 10$ mm working cavity, so pressure stays balanced even at low loads – reducing the risk of micro-short circuits caused by offset loading while giving consistent, repeatable pellet forming for solid electrolytes, electrode stacks and small-format all-solid-state cells.

The mold body uses a PEEK-ceramic composite core reinforced with alloy-steel structural parts. This combination delivers the electrical insulation and chemical inertness needed for electrochemistry, together with the mechanical strength to reach 5 T of pressing force. The same split-cell fixture carries the workflow from powder pressing and pellet forming through cell assembly to ionic-conductivity testing – one mold covers the main line of solid-state battery research, reducing sample transfer between instruments.

Two variants share one platform: the **Standard** variant (MOL5B100A-STD), a pure mechanical mold with no wiring or software, and the **With-Sensor** variant (MOL5B100A-PS1), which integrates a load sensor at the bottom of the clamping fixture for real-time stack-force readout. Both variants share the same single-point pressing geometry and dual-seal design, so an experiment started on the mechanical version can be upgraded to quantitative force monitoring without changing the experimental protocol.

1.2 Key Features

1. **Single-point axial pressing.** Stack force is delivered along the centerline of the cavity, keeping pressure balanced even at low loads and avoiding the micro-shorts caused by offset loading. The simple structure is intuitive to operate and easy to maintain.
2. **PEEK-ceramic composite core.** The inner assembly combines a PEEK composite body with ceramic and alloy-steel components, delivering electrical insulation, chemical resistance and mechanical stability up to 5 T.
3. **Dual-seal structure.** Two fluoroelastomer (FKM) seal rings improve sealing reliability across pressing and glove-box workflows.
4. **Optional quantitative pressure monitoring.** The With-Sensor variant integrates a bottom-mounted load sensor with selectable 500 / 1000 / 3000 / 5000 kg ranges, turning a mechanical variable into quantitative data.
5. **Compact and glove-box friendly.** $\varnothing 36 \times H62$ mm mold body weighing 180 g, standard $\varnothing 10$ mm cavity, fast sample loading and electrode swapping.

1.3 Standard Components

Each MOL5B100A is supplied as a complete kit. Figure 1.1 shows the product; Chapter 2 explains the function of every part.



Figure 1.1 – MOL5B100A single-point pressing solid-state battery test mold (product view)

02 Chapter 2 Main Structure

The mold uses a split-cell, single-point architecture. An alloy-steel upper punch and lower punch close on a PEEK-ceramic composite liner with a $\varnothing 10$ mm bore; the liner and punches sit inside an alloy-steel clamping fixture ($\Phi 65 \times H104$ mm) that transmits the press load along one central axis. Two fluoroelastomer (FKM) seal rings seal the cavity against air and moisture for glove-box work. On the With-Sensor variant, a load sensor is mounted at the bottom of the clamping fixture and reports the stack force in real time through PLC intelligent control.



Figure 2.1 – Mold body and clamping fixture (product view)

2.1 Component List

1. **Upper punch assembly** – top plunger, closes the cavity and transmits the stack force to the powder.
2. **Lower punch assembly** – bottom plunger, supports the powder stack and ejects the pellet.
3. **PEEK-ceramic composite liner** – $\varnothing 10$ mm working cavity; electrical insulation and chemical resistance.
4. **Dual FKM seal rings** – cavity sealing against air and moisture.
5. **Alloy-steel clamping fixture** – $\Phi 65 \times H104$ mm; aligns and holds the mold, transmits the press load.
6. **Load sensor module** – With-Sensor variant only; bottom-mounted, 500 / 1000 / 3000 / 5000 kg selectable ranges.
7. **Fasteners** – locking nuts and washers.
8. **Accessories** – loading tools and spares.

03 Chapter 3 Main Specifications

3.1 Basic Parameters

Model / variants	MOL5B100A-STD (Standard) · MOL5B100A-PS1 (With Pressure Sensor)
Working cavity diameter	φ10 mm — customizable on request
Mold body dimensions	Φ36 mm × H62 mm
Mold body weight	180 g
Clamping fixture dimensions	Φ65 mm × H104 mm
Clamping fixture weight	1.0 kg (Standard) / 1.3 kg (With-Sensor)
Core materials	Ceramic, PEEK, alloy steel
Sealing	Dual-seal ring structure — fluoroelastomer (FKM)
Maximum stack force	5 T (≈ 620 MPa over the φ10 mm cavity)
Maximum operating temperature	200 °C (mold body material rating)
Control method	Manual mechanical (Standard) / PLC intelligent control (With-Sensor)
Load sensor range (With-Sensor)	500 kg / 1000 kg / 3000 kg / 5000 kg, selectable on request
Application	Solid-state battery research, electrolyte pellet pressing, cell assembly, ionic-conductivity testing, lithium-metal anode studies, process validation

3.2 Component Details

Molding parts	Upper punch, lower punch	Alloy steel
Cavity liner	PEEK-ceramic composite liner	φ10 mm bore
Sealing	Dual seal rings	Fluoroelastomer (FKM)
Structural parts	Clamping fixture, fasteners	Alloy steel
Sensing (With-Sensor variant)	Load sensor module	Bottom-mounted; signal output, accuracy and power-supply specifications to be confirmed in a later revision

NOTE

Custom cavity diameters are available on request. Sensor electrical specifications (output signal, accuracy, supply voltage) will be documented in a later revision of this manual. 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 glove box where your material system requires it.

1. **Inspection.** Check that all components are clean, dry and undamaged; verify that both seal rings are fully seated in their grooves.
2. **Assembly.** Insert the lower punch into the liner bore, then place the liner assembly into the clamping fixture.
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.
5. **Mounting.** Place the fixture at the centre of the platen of a laboratory tablet press or hydraulic jack, so that the pressing axis passes through the centre of the cavity.
6. **Pressing.** Raise the pressure gradually to the target stack force (do not exceed 5 T) and hold for the required dwell time.
7. **Force readout (With-Sensor variant).** Connect the load sensor as described in the interface guide supplied with the mold and monitor the stack force in real time; keep the applied force within the selected sensor range.
8. **Demolding.** Release the pressure slowly, open the fixture and retrieve the pellet with non-metallic tweezers.
9. **Cell assembly / testing.** Proceed with cell assembly or ionic-conductivity testing in the same fixture as your protocol requires.
10. **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 – SENSOR RANGE SELECTION

The 500–1000 kg ranges are normally sufficient for routine solid-electrolyte and lithium-metal studies; choose 3000–5000 kg for high-modulus oxide systems or processes needing a larger safety margin. The default shipping range is 1000 kg – state your preferred range when ordering.



Figure 4.1 – With-Sensor variant: bottom-mounted load sensor inside the clamping fixture (product view)

Figure 4.2 – Compact $\Phi 36 \times H62$ mm mold body (product view)

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.
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 liner bore for burrs or residue and clean it with anhydrous ethanol.
3	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.
4	Sensor reading abnormal or drifting (With-Sensor variant)	• Check the sensor connector and cabling; re-seat the connection. • Confirm the applied force is within the selected range – overload can permanently shift the reading. • If the fault persists, contact business@labcorematerials.com.
5	Mold cannot be fully closed	• Confirm that all parts are correctly aligned and inspect the positioning features. • Remove any foreign debris so the fixture closes completely.

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 and the seal-ring grooves.
2. **Wear inspection.** Check the punches, liner bore and seal rings 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 alloy-steel parts. Wipe off all anti-rust oil completely before the next use.
3. **Impact handling.** The PEEK-ceramic composite 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 5 T (≈ 620 MPa over the $\varnothing 10$ 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 5 T, or permanent structural damage may occur.
2. **Temperature limit.** Do not operate above 200 °C in order to prevent polymer ageing of the composite body.
3. **Centred mounting.** Always place the fixture at the centre of the press platen to avoid offset loading.
4. **Sensor limit (With-Sensor variant).** Never apply force beyond the selected sensor range; overload can permanently damage the load sensor.
5. **Personal safety.** Wear safety goggles during operation to prevent pinch injury or material splashing.
6. **Material limitation.** The PEEK-ceramic composite 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 or the With-Sensor variant (load sensor options and read-out solutions)? business@labcorematerials.com.

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