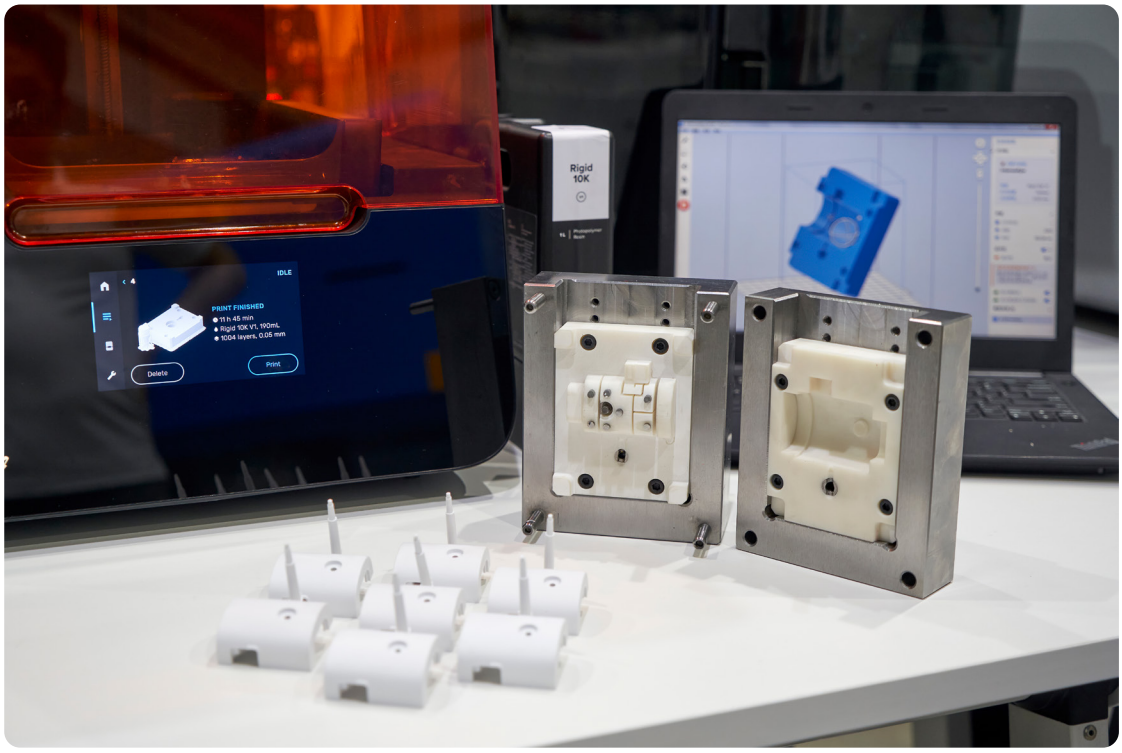
INFO SHEET

formlabs

# Injection Molding with 3D Printed Molds: Process Conditions

Injection molds need to withstand clamping pressures, injection pressures, injection temperatures, and any coolants or mold release agents that may be used. Doing so ensures the mold can be repeatedly used over time and consistently produce parts true to the original design.

Injection molds fabricated with Formlabs 3D printers have been tested with both desktop and industrial injection molding machines under a wide range of conditions. These low-volume molds are capable of withstanding hundreds to thousands of shots, depending on several factors including the part design, mold and injection materials, molding parameters, and any coolants or demolding agents used.




Formlabs offers a range of materials that are capable of replacing aluminum molds for low-volume manufacturing.

- The combination of strength, stiffness, and thermal resistance makes **Rigid 10K Resin** an ideal material for injection molds. The advanced strength ensures a mold made from Rigid 10K Resin can withstand the clamping and injection pressures without breaking, while the high stiffness enables the mold to maintain its shape under these pressures and produce accurate parts.
- **High Temp Resin** is an alternative material that can be considered when clamping and injection pressures are not too high and Rigid 10K Resin cannot meet the required injection temperatures.
- **Grey Pro Resin** should be chosen when pressures and temperatures are low and the dimensional accuracy of your molded part is less critical. Molds made from Grey Pro Resin will bend before breaking, potentially increasing longevity, but potentially worsening accuracy over time as the mold is used.

| COMPANY | PART | 3D PRINTER | PRINTING RESIN | MOLD POST TREATMENT * | INJECTION MOLDING MACHINE | TYPE OF INJECTION MOLDING MACHINE | INJECTED MATERIAL | INJECTED TEMPERATURE (°C) | CLAMPING PRESSURE (TON) | INJECTED PRESSURE (PSI) | INJECTED PRESSURE (BAR) | COOLING METHOD | EJECTION METHOD | CYCLE TIME (S) | NUMBER OF CYCLES PER MOLD ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Multiplus** | Electronic housing | | | CNC machining | Babyplast 10/12 Standard | Industrial | ABS | 220 | 10 | 1378 | 95 | compressed air | ejector pins | 160 | 60+ |
| **Holimaker** | Eyewear frame | | | Hand sanding | Holipress | Manual desktop | ASA | 240 | NA | NA | NA | ambient air | manual | 120 | 70 |
| **Novus Applications** | Threaded cap | | | CNC machining | Sumitomo 50 Ton | Industrial | HDPE | 204 | 30 | 7200 | 496 | switch cores | manual | 68 | 100 |
| **Shoptbotix** | Shaft bushing | | | Hand sanding | Micromolder | Automated desktop | HDPE | 250 | 1.2 | NA | NA | ambient air | ejector pins | 200 | 100+ |
| **MPM** | Shaft | | | machining | DEMAG 25 tons | Industrial | HDPE | 185 | 25 | 798 | 55 | cooling channels | ejector pins | 80 | 70+ |
| **MPM** | Shaft | | | machining | DEMAG 25 tons | Industrial | LDPE | 185 | 25 | 798 | 55 | cooling channels | ejector pins | 80 | 70+ |
| **Holimaker** | Eyewear frame | | | Hand sanding | Holipress | Manual desktop | PA | 240 | NA | NA | NA | ambient air | manual | 120 | 70 |
| **ARaymond** | Connector | | | machining | Boy XS | Industrial | PA 12 GF30 | 180 | 9 | 3626 | 250 | cooling channels | ejector pins | 90 | 100+ |
| **Holimaker** | Valve connector | | | Hand sanding | Holipress | Manual desktop | PA 6 GF15 | 250 | NA | NA | NA | none | manual | 120 | 12+ |
| **Holimaker** | Footbal cleat | | | Hand sanding | Holipress | Manual desktop | PA 6.6 | 270 | NA | NA | NA | ambient air | manual | 120 | 12 |
| **Multiplus** | Electronic housing | | | CNC machining | Babyplast 10/12 Standard | Industrial | PC | 260 | 10 | 1595 | 110 | compressed air | ejector pins | 180 | 4 |
| **Multiplus** | Electronic housing | | | CNC machining | Babyplast 10/12 Standard | Industrial | PC-ABS | 240 | 10 | 1378 | 95 | compressed air | ejector pins | 160 | 60+ |
| **Holimaker** | Footbal cleat | | | Hand sanding | Holipress | Manual desktop | POM | 180 | NA | NA | NA | ambient air | manual | 120 | 60+ |
| **Holimaker** | Valve connector | | | Hand sanding | Holipress | Manual desktop | POM | 180 | NA | NA | NA | none | manual | 120 | 12+ |
| **Braskem** | Mask strap | | | Hand sanding | Cincinnati Milacron 110 Ton Roboshot | Industrial | PP | 230 | 5 | 5000 | 345 | ambient air | manual | 30 | 1500 |
| **Holimaker** | Footbal cleat | | | Hand sanding | Holipress | Manual desktop | PP | 210 | NA | NA | NA | ambient air | manual | 120 | 60+ |
| **IPC** | Test part | | | CNC machining | Engel 150T | Industrial | PP | 200 | 12.5 | 2611 | 180 | ambient air | ejector pins | 150 | 90 |
| **IPC** | Test part*** | | | CNC machining | Engel 150T | Industrial | PP | 200 | 12.5 | 2611 | 180 | ambient air | ejector pins | 150 | 1000 |
| **Moraine Park Technical College** | Cooking form | | | Manually degate | Mitsubishi 90 Ton | Industrial | PP | 225 | 10 | 2900 | 200 | ambient air | ejector pins | 180 | 50+ |
| **Multiplus** | Electronic housing | | | CNC machining | Babyplast 10/12 Standard | Industrial | PP | 180 | 10 | 870 | 60 | compressed air | ejector pins | 160 | 100+ |
| **Novus Applications** | Threaded cap | | | CNC machining | Sumitomo 50 Ton | Industrial | PP | 199 | 30 | 6800 | 469 | switch cores | manual | 48 | 100 |
| **Novus Applications** | Threaded cap | | | CNC machining | Sumitomo 50 Ton | Industrial | PP | 210 | 30 | 9500 | 655 | switch cores | manual | 50 | 100 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3D Strong** | Lens test part | Form 3 | Rigid 10K | CNC machining | NA | Industrial | PP | 230 | NA | 508 | 35 | compressed air | manual | 51 | 150 |
| **Glassboard** | Rigid tube | Form 3 | Rigid 10K | Polish/Mold Release | LNS Technologies Model 150A | Manual desktop | PP | 215 | NA | NA | NA | ambient air | manual | 300 | 9+ |
| **APSX LLC** | Threaded nut | Form 3+ | Rigid 10K | Hand sanding | APSX-PIM V2 | Automated Desktop | PP | 180 | 2.25 | 1668 | 115 | fan air | printed ejector pins | 65 | 500+ |
| **Holimaker** | Face shield clip | Form 3 | Grey Pro | Hand sanding | Holipress | Manual desktop | PP food-grade | 220 | NA | NA | NA | ambient air | manual | 120 | 100 |
| **ARaymond** | Connector | Form 3 | Rigid 10K | machining | Boy XS | Industrial | PP GF30 | 215 | 9 | 3626 | 250 | cooling channels | ejector pins | 90 | 100+ |
| **Bedal NV** | Catheter devices | Form 3 | High Temp | Pre-heating in oven at 60°C" | Galomb inc B-100 | Manual desktop | TPE | 218 | NA | NA | NA | ambient air | manual | 120 | 20+ |
| **Bedal NV** | Catheter devices | Form 3 | Rigid 10K | Pre-heating in oven at 60°C" | Galomb inc B-100 | Manual desktop | TPE | 218 | NA | NA | NA | ambient air | manual | 120 | 30+ |
| **Glassboard** | Elastomeric tip | Form 3 | Rigid 10K | Polish/Mold Release | LNS Technologies Model 150A | Manual desktop | TPU Pellethane - 55D | 207 | NA | NA | NA | ambient air | manual | 300 | 10+ |
| **Glassboard** | Elastomeric tip | Form 3 | Rigid 10K | Polish/Mold Release | LNS Technologies Model 150A | Manual desktop | TPU Pellethane - 55D | 204 | NA | NA | NA | ambient air | manual | 300 | 12+ |
| **Prototyping Tech** | Camera sprig 2 cavities | Form 3 | Rigid 10K | Beadblasting, Etching, Sanding | Morgan Press | Manual desktop | TPU - 95A | 205 | 12 | 4000 | 275 | ambient air | manual | 180 | 100+ |
| **Prototyping Tech** | Camera sprig 6 cavities | Form 3 | Rigid 10K | Beadblasting, Etching, Sanding | Morgan Press | Manual desktop | TPU - 95A | 205 | 12 | 4000 | 275 | ambient air | manual | 180 | 100+ |

Form 3 · Form 3+ · Form 3L · Form 2

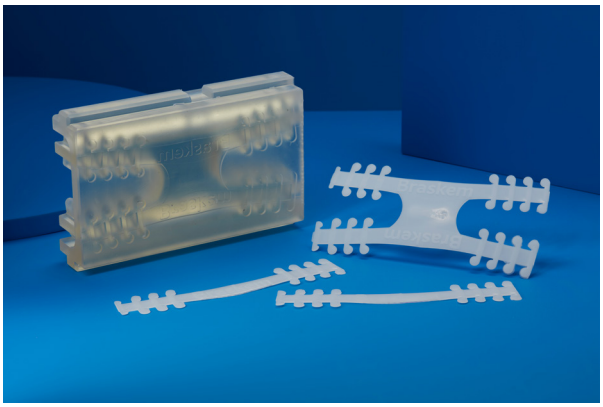
Rigid 10K · Grey Pro · High Temp

* It is recommended to post-treat the printed mold to meet critical dimensions. CNC machining is ideal for post-treatment when available, but hand machining or sanding are good alternatives.

** The number of cycles with a + indicates that the mold was not tested to failure. The customer stopped the process when the printed mold was still in good condition and could potentially be used for more cycles.

*** Multi-material mold with a core printed in Rigid 10K Resin and a frame printed in PA12 with SLS technology to absorb pressure

*Threaded cap from Novus Applications*

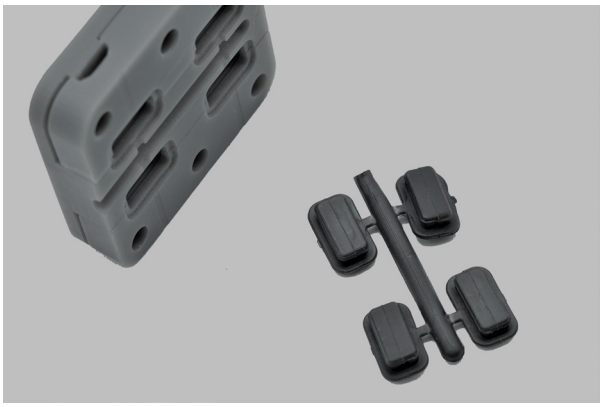


*Mask strap from Braskem*

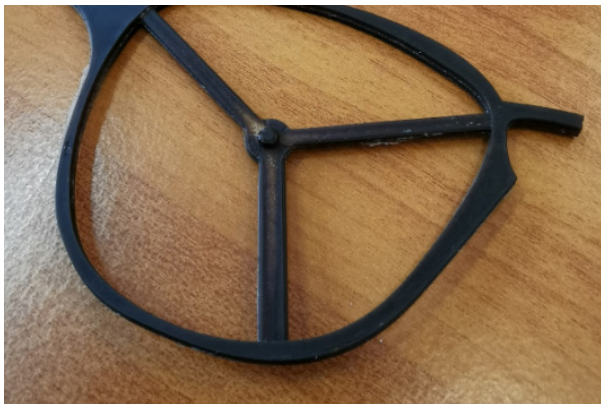
*Football cleat from Holimaker*

*Electronic housing from Multiplus*

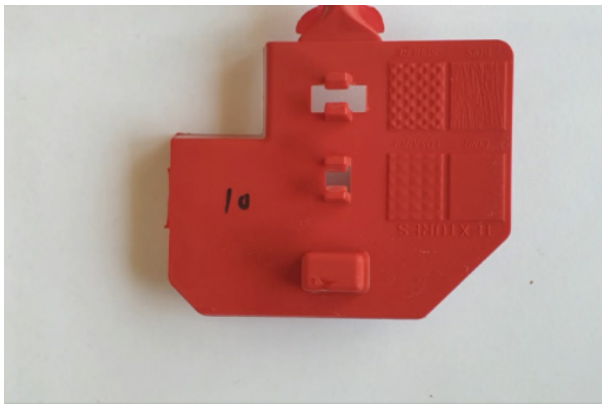
*Shaft Bushing from Shopbotix*



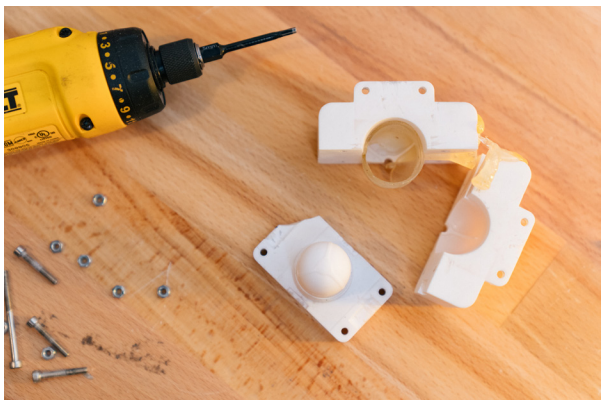
*Face shield clip from Holimaker*



*Eyewear frame from Holimaker*

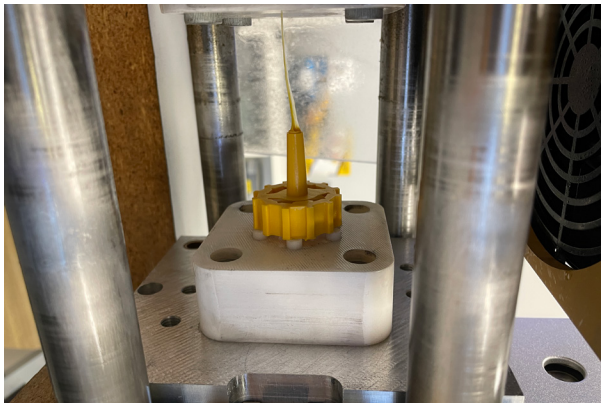


*Test part from IPC*



*Elastomeric tip from Glassboard*

*Camera sprig from Prototyping Tech*



*Threaded nut from APSX*