

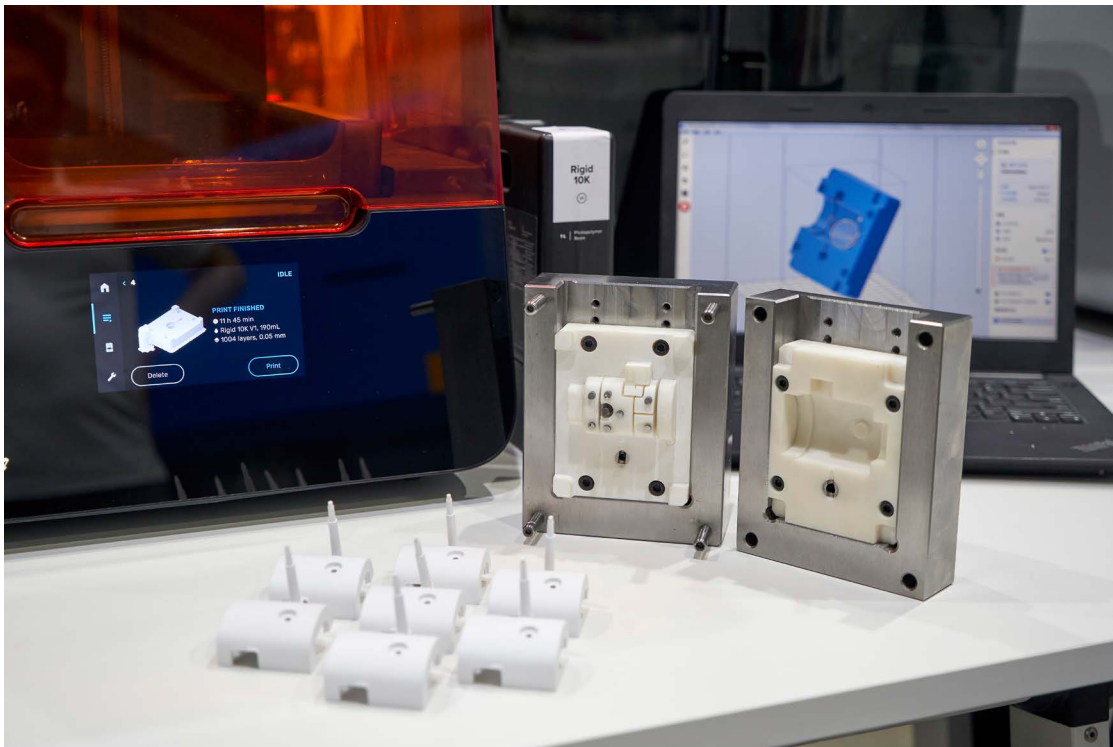


INFO SHEET

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	none	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	none	ejector pins	200	100+
Holimaker	Eyewear frame			Hand sanding	Holipress	Manual desktop	PA	240	NA	NA	NA	none	manual	120	70
Holimaker	Football cleat			Hand sanding	Holipress	Manual desktop	PA 6.6	270	NA	NA	NA	none	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	Football cleat			Hand sanding	Holipress	Manual desktop	POM	180	NA	NA	NA	none	manual	120	60+
Braskem	Mask strap			Hand sanding	Cincinnati Milacron 110 Ton Roboshot	Industrial	PP	230	5	5000	345	none	manual	30	1500
Holimaker	Football cleat			Hand sanding	Holipress	Manual desktop	PP	210	NA	NA	NA	none	manual	120	60+
IPC	Test part			CNC machining	Engel 150T	Industrial	PP	200	12.5	2611	180	none	ejector pins	150	90
IPC	Test part***			CNC machining	Engel 150T	Industrial	PP	200	12.5	2611	180	none	ejector pins	150	1000
Moraine Park Technical College	Cooking form			Manually degate	Mitsubishi 90 Ton	Industrial	PP	225	10	2900	200	none	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
3D Strong	Lens test part			CNC machining	NA	Industrial	PP	230	NA	508	35	compressed air	manual	51	150
Holimaker	Face shield clip			Hand sanding	Holipress	Manual desktop	PP food-grade	220	NA	NA	NA	none	manual	120	100



Form 3



Form 3L



Rigid 10K



Grey Pro

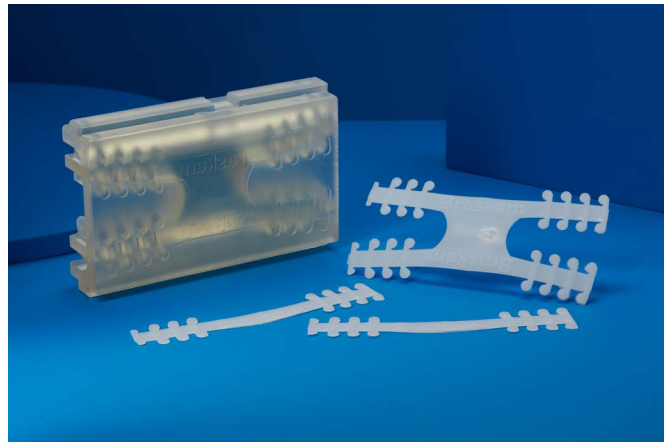


High Temp

- * 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



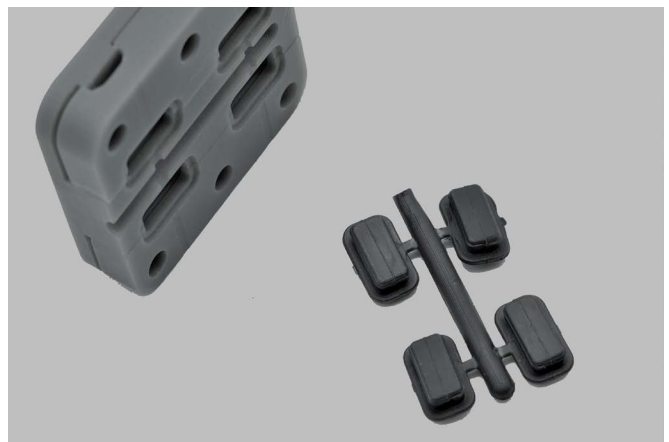
Football cleat from Holimaker



Electronic housing from Multiplus



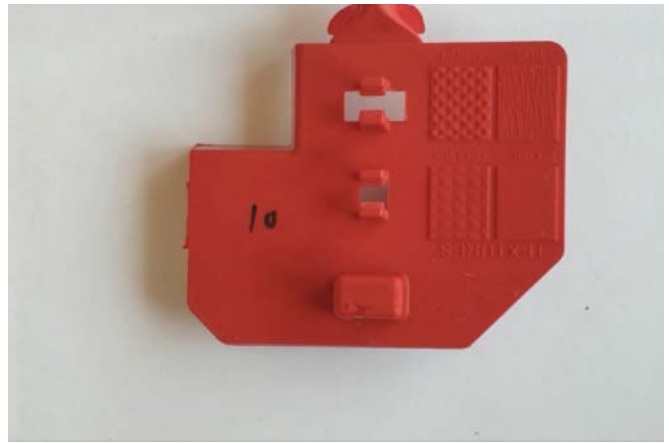
Shaft Bushing from Shopbotix



Face shield clip from Holimaker



Eyewear frame from Holimaker



Test part from IPC