

Materials List for:

# Rapid and Low-cost Prototyping of Medical Devices Using 3D Printed Molds for Liquid Injection Molding

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## Materials

Name	Company	Catalog Number	Comments
ABS Model Material	Stratasys	P430	Model Material for uPrint Plus SE (Step: Mold Design & Production)
Soluble Support Material	Stratasys	SR-30	Support Material for uPrint Plus SE (Step: Mold Design & Production)
Underwater Silicone Sealant, 2.8 Oz Tube, Clear	McMaster-Carr Supply Company	7327A21	Silicone RTV for sealing gaps at mold parting lines (Step: Mold Assembly)
Tubing, 1/8" ID, 1/4" OD, 1/16" Wall Thickness, Ultra-chemical-resistant Tygon PVC, Clear	McMaster-Carr Supply Company	5046K11	Forms runner/sprue adapter between mold and syringe with elastomer (Step: Elastomer Mixing)
Coupling, Adapter, Straight, Male Quick-turn (Luer lock) X 1/8" Tube Barb, Nylon	McMaster-Carr Supply Company	51525K123	Connect runner/sprue between mold and syringe with elastomer (Step: Elastomer Mixing)
Coupling, Adapter, Straight, Female Quick-turn (Luer lock) X 1/8" Tube Barb, Nylon	McMaster-Carr Supply Company	51525K213	Connect runner/sprue between mold and syringe with elastomer (Step: Elastomer Mixing)
Cap, Female Quick-turn (Luer lock), Nylon	McMaster-Carr Supply Company	51525K315	Cap to prevent silicone from leaking out of mold after injection (Step: Elastomer Mixing)
Liquid Silicone Rubber (LSR) 30 - 10:1, Implant Grade	Applied Silicone Corporation	PN40029	Substitute with the elastomer of your choice. This is the one used for the intravaginal probe (Step: Elastomer Mixing)
Syringes (BD), 1 ml Slip-Tip, non-sterile clean, bulk	Cole-Parmer	WU-07945-00	Syringes for transferring elastomer material (Step: Elastomer Mixing)
Syringes (BD), 1 ml Slip-Tip, non-sterile clean, bulk	Cole-Parmer	WU-07945-04	Syringes for transferring elastomer material (Step: Elastomer Mixing)
Syringe, 20 ml, Open Bore, Solid Ring Plunger and Grip	Qosina Corporation	C1200	Syringes for transferring elastomer material. Open bore is used for very viscous elastomers. (Step: Elastomer Mixing)
Needle (BD), Non-sterile Clean with Shields, 18 G x 1.5" Lg., Stainless Steel, BD Bulk	Cole-Parmer	WU-07945-76	Used for removing air column between syringe plunger and elastomer (Step: Elastomer Mixing)
Plastic Cups, 12 Oz., Clear	Safeway	N/A	Used for mixing silicone in THINKY Mixer (Step: Elastomer Mixing)
Polyethylene Bag, Open-Top, Flat, 5" Width x 6" Height, 2-MIL Thk.	McMaster-Carr Supply Company	1928T68	Used for mixing silicone in THINKY Mixer (Step: Elastomer Mixing)
Rubber Band, Latex Free, Orange, Size 64, 3-1/2" L x 1/4" W	McMaster-Carr Supply Company	12205T96	Used for mixing silicone in THINKY Mixer (Step: Elastomer Mixing)

Parafilm Wrap, 4" W	Cole-Parmer	EW-06720-40	Used for mixing silicone in THINKY Mixer (Step: Elastomer Mixing)
Syringe Barrels with Stoppers, Luer Lock, Air Operated, 50 ml	EWD Solutions	JEN-JG50A-15	Smaller syringes can be used if less elastomer is required, but make sure it is compatible with Air Operated Syringe Adapter in injection chamber (Step: Elastomer Mixing)
Sealant Tape, Pipe Thread, 50' Lg x 1/4" W, 0.0028" Thk, 0.5 G/CC Specific Gravity	McMaster-Carr Supply Company	4591K11	Teflon Tape for air-tight seals around at threads (Step: Elastomer Injection)
Scalpel Blades, Disposable, No. 22	VWR	21909-646	Used for cutting tubing and demolding (Step: Curing & Demolding)
Kimwipes	VWR	21903-005	(Step: Curing & Demolding)
2-Propanol, J. T. Baker	VWR	JT9334-3	(Step: Curing & Demolding)
uPrint Plus SE 3D Printer	Stratasys	uPrint Plus SE	Other 3D printers can be used (Step: Mold Design & Production)
Screw, Cap, Hex Head, 1/4"-28, 2-1/2" Lg, 18-8 Stainless Steel	McMaster-Carr Supply Company	92198A115	Screws used with nuts to compress mold (Step: Mold Assembly)
Nut, Hex, 1/4"-28, 7/16" Wd, 7/32" Height, 18-8 Stainless Steel	McMaster-Carr Supply Company	91845A105	Screws used with nuts to compress mold (Step: Mold Assembly)
Stud, Fully Threaded, 1/4"-28, 1" Lg, 18-8 Stainless Steel	McMaster-Carr Supply Company	95412A567	Threaded-rods can be cut to desired length and are used with nutes to compress mold (Step: Mold Assembly)
Planetary Centrifugal Mixer	THINKY USA Inc.	ARE-310	Mixers are strongly recommended for fine mixing and to reduce degassing time, but hand mixing is fine (Step: Elastomer Mixing)
Laboratory Weigh Scale	Mettler-Toledo International Inc.	EL602	(Step: Elastomer Mixing)
Desiccant Vacuum Canister, Reusable, 10-3/4" OD	McMaster-Carr Supply Company	2204K7	This desiccator is used for degassing the elastomer (Step: Elastomer Mixing)
Custom 3D-Printed Mixer-to-Cup Adapter	N/A	N/A	Modeled in Solidworks CAD and 3D printed (Step: Elastomer Mixing)
Tubing, Smooth Bore, 1/4" ID, 1/2" OD, 1/8" Wall Thickness, High Purity Tygon PVC, Clear	McMaster-Carr Supply Company	5624K51	Tubing outside of Desiccator (Step: Elastomer Injection)
Tubing, Smooth Bore, 3/8" ID, 5/8" OD, 1/8" Wall Thickness, High Purity Tygon PVC, Clear	McMaster-Carr Supply Company	5624K52	Tubing to adapt to Air/Vacuum Supply (Step: Elastomer Injection)
Coupling, Reducer, Straight, Vacuum Barb 3/8" Tube ID X Vacuum Barb 1/4" Tube ID, Brass	McMaster-Carr Supply Company	44555K188	Adapt Tubing outside Desiccator to Tubing leading to Air/Vacuum Supply (Step: Elastomer Injection)
Clamp, Hose & Tube, Worm-Drive, for 7/32" to 5/8" OD tube, 5/16" Wd., 316 SS	McMaster-Carr Supply Company	5011T141	Used on tubing to create Air/Vacuum-tight seal at junctions (Step: Elastomer Injection)
Clamp, Hose, Smooth-Band Worm-Drive, for 1/2" to 3/4" OD tube, 3/8" Wd., 304 SS	McMaster-Carr Supply Company	5574K13	Used on tubing to create Air/Vacuum-tight seal at junctions (Step: Elastomer Injection)
Coupling, Tee, Vacuum Barb 1/4" Tube ID, Brass	McMaster-Carr Supply Company	44555K138	Tee Junction between Vacuum, Three-way T-valve on Desiccator, and Three-way L-valve (Step: Elastomer Injection)
Coupling, Tee, 1/4 NPT Female X Female X Male, Brass	McMaster-Carr Supply Company	50785K222	Tee Junction between Pressure Gauge, Chamber, and Three-way L-valve (Step: Elastomer Injection)

Valve, Ball, Straight, T-Handle, 1/4 NPT Female X Male, Brass	McMaster-Carr Supply Company	4082T42	Three-way L-valve (Step: Elastomer Injection)
Coupling, Adapter, Straight, Vacuum Barb 1/4" ID Tube X 1/4 NPT Male, Brass	McMaster-Carr Supply Company	44555K132	Adapter for Three-way L-valve-to-Tubing (Step: Elastomer Injection)
Saw, Hole, Bimetal. 1-3/8" OD, 1-1/2" Cutting Depth	McMaster-Carr Supply Company	4066A25	Used to cut holes in Desiccator for throughwall fittings (Step: Elastomer Injection)
Arbor, 9/16" to 1-3/16" Saw, 1/4" Hex	McMaster-Carr Supply Company	4066A76	Used to cut holes in Desiccator for throughwall fittings (Step: Elastomer Injection)
Arbor Adapter for 1-1/4" Thru 6" Dia Hole Saws	McMaster-Carr Supply Company	4066A77	Used to cut holes in Desiccator for throughwall fittings (Step: Elastomer Injection)
Coupling, Straight, Through-Wall, 1/2 NPT Female, Polypropylene	McMaster-Carr Supply Company	36895K141	Throughwall fittings leading to Pressure/Vacuum Gauges (Step: Elastomer Injection)
Coupling, Adapter, Straight, Reducing, Bushing, Hex, 1/2 NPT Male X 1/4 NPT Female, Brass	McMaster-Carr Supply Company	4429K422	Reducing tube diameter inside the Desiccator to adapt to Air-operated Syringe System (Step: Elastomer Injection)
Coupling, Adapter, Straight, Reducing, Bushing, Hex, 1/4 NPT Male X 1/8 NPT Female, Brass	McMaster-Carr Supply Company	4757T91	Reducing tube diameter inside the Desiccator to adapt to Air-operated Syringe System (Step: Elastomer Injection)
Coupling, Adapter, Straight, Vacuum Barb 1/4" ID Tube X 1/8 NPT Female, Brass	McMaster-Carr Supply Company	44555K124	Reducing tube diameter inside the Desiccator to adapt to Air-operated Syringe System (Step: Elastomer Injection)
Syringe Adapters, Air Operated, 30/50 ml	EWD Solutions	JEN-JG30A-X6	Air operated syringe adapter on the inside of the Desiccator; must be compatible with syringes used to hold elastomer (Step: Elastomer Injection)
Gauge, Dual-Scale Vacuum, 2-1/2" Dial, 1/4 NPT Male, Bottom Connector, 30" Hg-0, Steel Case	McMaster-Carr Supply Company	4002K11	Vacuum Gauge (Step: Elastomer Injection)
Gauge, Dual-Scale Vacuum and Compound, 3-1/2" Dial, 1/4 NPT Male, Center Back, 30" Hg-0, 100 PSI, Steel Case	McMaster-Carr Supply Company	4004K616	Pressure Gauge leading to Air-operated Syringe System (Step: Elastomer Injection)
Oven, Vacuum, Isotemp, Economy	Fisher Scientific	280A	Standard non-vacuum oven can be used (Step: Curing & Demolding)
Solidworks CAD	Dassault Systèmes	Solidworks Research Subscription	Other CAD Software can be used for mold master and mold design (Step: Mold Design & Production)