

BILL OF MATERIALS: CERA-1 CLAY EXTRUDER

I.) Hardware and Fasteners

Stainless Steel Machine Screws: M3

| Qty | Size | Lng | Style | Location | Source | ~ Cost ea | ~ Cost Total |
|-----|------|------|--------------------|-----------------------|---|-----------|--------------|
| 4 | M3 | 5mm | Socket Set Screw | Guide Follower | https://www.belmetric.com/3mm-c-563_581_1026_163/ | 0.1 | 0.4 |
| 8 | M3 | 8mm | Socket Button Head | Tube Holder | https://www.belmetric.com/3mm-c-563_581_584_603/ | 0.05 | 0.4 |
| 4 | M3 | 8mm | Socket Flat Head | Tube Holder | https://www.belmetric.com/3mm-c-563_581_583_609/ | 0.06 | 0.24 |
| 4 | M3 | 12mm | Allen Socket Head | Auger housing - motor | https://www.belmetric.com/3mm-c-563_581_582_585/ | 0.06 | 0.24 |
| 2 | M3 | 20mm | Allen Socket Head | Tube Holder | https://www.belmetric.com/3mm-c-563_581_582_585/ | 0.07 | 0.14 |
| 4 | M3 | 30mm | Allen Socket Head | Auger housing - stage | https://www.belmetric.com/3mm-c-563_581_582_585/ | 0.1 | 0.4 |

Stainless Steel Machine Screws: M4

| Qty | Size | Lng | Style | Location | Source | | |
|-----|------|------|-------------------|-------------------------|---|------|------|
| 4 | M4 | 5mm | Socket Flat Head | Tube Base | https://www.belmetric.com/4mm-c-563_581_583_610/ | 0.1 | 0.4 |
| 4 | M4 | 12mm | Allen Socket Head | Plunger | https://www.belmetric.com/4mm-c-563_581_582_586/ | 0.08 | 0.32 |
| 8 | M4 | 16mm | Allen Socket Head | End Mount | https://www.belmetric.com/4mm-c-563_581_582_586/ | 0.09 | 0.72 |
| 2 | M4 | 18mm | Allen Socket Head | End Mount - Stage | https://www.belmetric.com/4mm-c-563_581_582_586/ | 0.12 | 0.24 |
| 10 | M4 | 20mm | Allen Socket Head | Base Mount, Guide Mount | https://www.belmetric.com/4mm-c-563_581_582_586/ | 0.11 | 1.1 |
| 2 | M4 | 22mm | Allen Socket Head | End Mount - Stage | https://www.belmetric.com/4mm-c-563_581_582_586/ | 0.18 | 0.36 |

Stainless Steel Machine Screws: Other

| Qty | Size | Lng | Style | Location | Source | | |
|-----|------|------|-------------------|-------------------------|---|------|------|
| 4 | M5 | 16mm | Allen Socket Head | Nema 23 Worm Gearbox | https://www.belmetric.com/5mm-c-563_581_582_587/ | 0.14 | 0.56 |
| 8 | M6 | 20mm | Allen Socket Head | Base Mount, Guide Mount | https://www.belmetric.com/6mm-c-563_581_582_588/ | 0.22 | 1.76 |

Stainless Steel Nuts: M3 & M4

| Qty | Size | Hgt | Style | Location | Source | | |
|-----|------|-------|--------------|-----------------------|---|------|------|
| 8 | M3 | 1.8mm | Square, Thin | Stage, Guide Follower | https://www.belmetric.com/square-nut-thin-c-563_578_ | 0.11 | 0.88 |
| 8 | M3 | 2.4mm | Hex | Tube Holder | https://www.belmetric.com/coarse-thread-c-563_578_6_ | 0.05 | 0.4 |
| 20 | M4 | 3.5mm | Square | End mount, Base mount | https://www.mcmaster.com/97258a102 | 0.22 | 4.4 |

II.) 3D Printed / Laser Cut Components

| Qty | File Name | Material | Location | Source (if applicable) | | |
|-----|---------------------|---------------------|-------------|---|------|------|
| 1 | auger_housing.stl | PETG or ABS, 100% i | Auger | | 1.52 | 1.52 |
| 1 | auger_screw.stl | Steel | Auger | https://www.shapeways.com/product/XDJKCNMEJ/cera- | 40 | 40 |
| 1 | auger_stage.stl | PETG or ABS, 100% i | Auger | | 1.9 | 1.9 |
| 1 | bearing_cover.stl | PETG or ABS, 100% i | Auger | | 0.02 | 0.02 |
| 1 | screwGuide_follower | PETG or ABS, 100% i | Screw Guide | | 0.11 | 0.11 |
| 1 | screwGuide_mountA | PETG or ABS, 20% in | Screw Guide | | 1.4 | 1.4 |
| 1 | screwGuide_mountB | PETG or ABS, 20% in | Screw Guide | | 0.86 | 0.86 |
| 1 | tube_baseMount.stl | PETG or ABS, 100% i | Ram | | 4.96 | 4.96 |
| 1 | tube_endMount.stl | PETG or ABS, 100% i | Ram | | 1.58 | 1.58 |
| 1 | tubeHolderA.stl | PETG or ABS, 100% i | Ram | | 0.5 | 0.5 |
| 1 | tubeHolderB.stl | PETG or ABS, 100% i | Ram | | 0.5 | 0.5 |
| 1 | wormGear_nut_coup | Steel | Ram | https://www.shapeways.com/product/TWY3G84AK/cera | 46 | 46 |
| 1 | plunger.stl | PETG or ABS, 100% i | Plunger | | 2.36 | 2.36 |
| 1 | gasket_A.dxf | Nitrile Rubber | Auger | https://www.faucetdepot.com/prod/lasco-02-1048E-Rui | 1.54 | 1.54 |
| 1 | gasket_B.dxf | Nitrile Rubber | Auger | | | |
| 2 | tubeHolder_grip.dxf | Nitrile Rubber | Tube Holder | | | |

III.) Mechanical Components / Hardware

Stainless Steel Ball Bearings

| Qty | ID | OD | Height | Location | Source | | |
|-----|-------|-------|--------|-----------------|---|-------|-------|
| 1 | 16mm | 35mm | 11mm | Tube Base Mount | https://bearingsdirect.com/ball-bearings/metric-sizes-ba | 6.69 | 6.69 |
| 1 | 1/4in | 3/4in | 9/32in | Auger | https://www.mcmaster.com/4648k13 | 18.14 | 18.14 |

Stainless Steel Washer

| Qty | ID | OD | Height | Location | Source | | |
|-----|-------|------|--------|-----------------|---|------|------|
| 1 | 6.4mm | 11mm | 1.6mm | Auger | https://www.belmetric.com/small-outer-diameter-c-4_3_ | 0.12 | 0.12 |
| 1 | 16mm | 30mm | 3mm | Tube Base Mount | https://www.belmetric.com/standard-outer-diameter-c-4_3_ | 0.3 | 0.3 |

Stainless Steel T10 Trapezoidal Lead Screw

| Qty | Size | Lng | Pitch, lead | Location | Source | | |
|-----|------|-------|-------------|----------|---|----|----|
| 1 | T10 | 700mm | 2mm, 2mm | Ram | https://www.aliexpress.com/item/32583087650.html | 40 | 40 |

Brass T10 Trapezoidal Lead Screw Nut

| Qty | Size | Pitch, lead | Location | Source | | |
|-----|------|-------------|--------------|---|------|------|
| 2 | T10 | 2mm, 2mm | Ram, Plunger | https://www.aliexpress.com/item/4000007745245.html | 4.99 | 9.98 |

Aluminum Square Tubing

| Qty | Size | Wall | Lng | Location | Source | | |
|-----|------|---------|-------|-------------|---|-------|-------|
| 1 | 1in | 1/16 in | 550mm | Screw Guide | https://www.homedepot.com/p/Everbilt-1-in-x-96-in-Alu | 20.48 | 20.48 |

Nema 17 Motor Coupling

| Qty | Size A | Size B | Diameter | Location | Source | | |
|-----|--------|--------|----------|----------|---|-----|-----|
| 1 | 6.35mm | 10mm | 20mm | Auger | https://www.aliexpress.com/item/32913158582.html?sq | 2.4 | 2.4 |

Draw Toggle Latch

| Qty | Length | Brand | Location | Source | | |
|-----|--------|--------|-------------|---|---|---|
| 2 | 38mm | uxcell | Tube Holder | https://www.aliexpress.com/item/32856362177.html | 2 | 4 |

IV.) Motors with Gearboxes

| Qty | Motor | Lng | Gearbox Type | Reduction Ratio | Source | | |
|-----|---------|------|--------------|-----------------|---|-----|-----|
| 1 | Nema 17 | 34mm | Planetary | 3.71 to 1 | https://www.aliexpress.com/item/4000221889379.html | 30 | 30 |
| 1 | Nema 23 | 56mm | Worm | 30 to 1 | https://www.aliexpress.com/item/33011508459.html?sp | 100 | 100 |

V.) O-Rings

| Qty | Diameter | Lng | Material | Location | Source | | |
|-----|----------|------|----------------|-------------------|---|------|------|
| 3 | 3mm | 60mm | Nitrile Rubber | Pluger, End Mount | https://www.aliexpress.com/item/4000181016661.html | 0.65 | 1.95 |

VI.) Nozzles

| | | |
|---|---|---|
| https://www.aliexpress.com/item/32738744288.html?spm=a2e0o_productlist.0.0.1e304f6eNn0Dlt&algo_pvid=df21f6af-004c-4882-b7 | 6 | 6 |
|---|---|---|

Total Cost (USD): 356.27