3DCONTROLS

CONVENTIONAL CERAMIC PRODUCTION

Until now, manufacturing has been defined by molds and setup time.

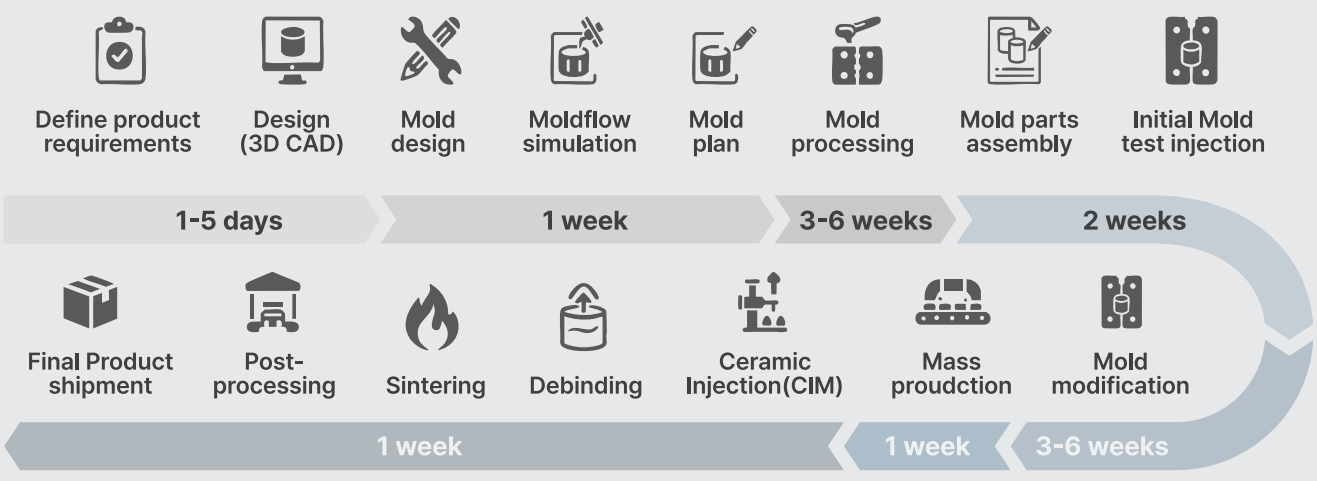
CNC machining

- Raw material preparation and jig fabrication
- CAM programming and machine setup
- Material loss and risk of part breakage during machining
- Long machining time and multiple iterations

CIM

- Mold fabrication, injection simulation, and trial shots
- Yield often below 50% due to shrinkage and defects
- Low-volume production requires multiple mold adjustments
- Mold setup and changeover required for every design variation

CONVENTIONAL CERAMIC INJECTION MOLDING PROCESS



Repeated modification and verification until the mold is completed, resulting in a long period and high cost.

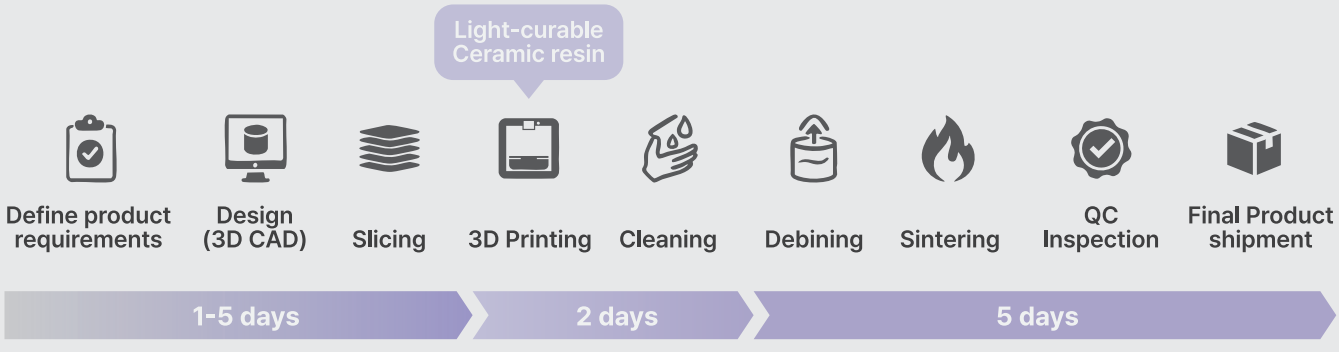
- Lead Time: 3D CAD Design → Mold Design → Mold Processing → Mold Modification → CIM → Sintering (8-15 weeks)
- Cost: tens of thousands of Dollars
- MOQ: At least 1K pcs for setup& operation Equipment
- Design: Limited to mold shape

3D PRINTING PRODUCTION

Change the standards of manufacturing, Change the rules of competition.

- No mold need and tooling cost
- Instant design changes with zero modification cost
- Easy setup and fast changeover
- Direct production from design files, complex internal channels are possible

3D PRINTING PROCESS



Repeated modification and verification until the mold is completed, resulting in a long period and high cost.

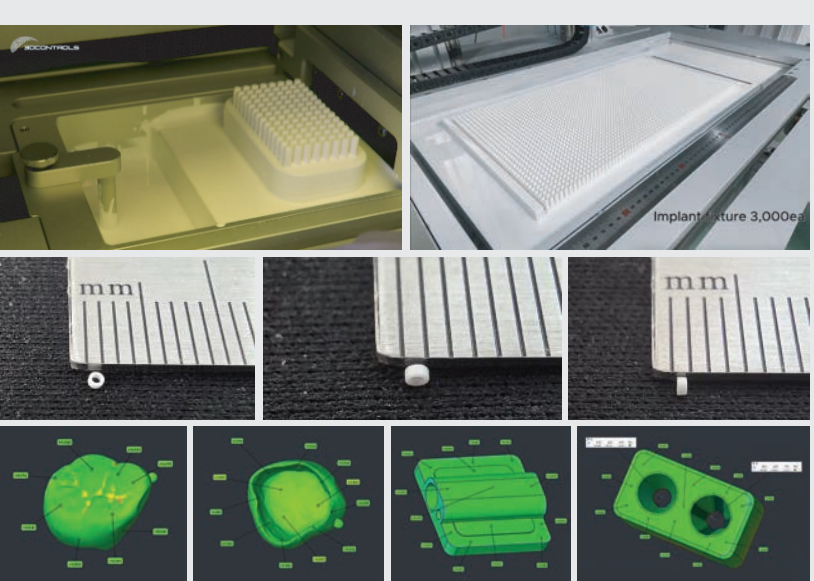
- Lead Time: 3D CAD Design → 3D printing → Sintering (5~10 days)
- Cost: No mold cost (Pay only for parts)
- MOQ: No minimum quantity (Produce from 1 piece)
- Design: Freedom of complex and non-moldable geometries

Ceramic 3D printer

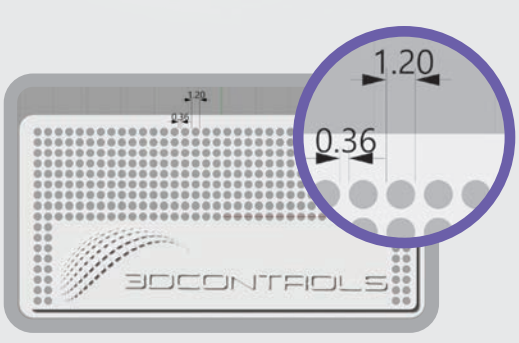
TD6+

Proprietary DLP 3D Printer

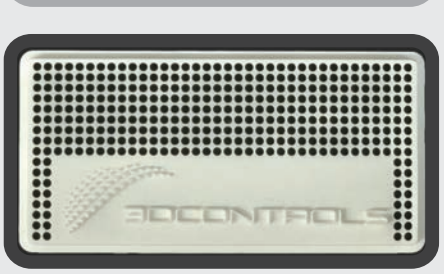
Method	Top-Down DLP AM
Build Volume	120 × 68 × 45 mm
Layer Thickness	25 - 100 μm ≤
Resolution	1,920 × 1,080 px
Pixel Pitch	70 μm
Printing Speed	Alumina: 8 sec / layer, Zirconia: 13 sec / layer
Product Size	515 × 510 × 1,600 mm
Weight	180 kg
Electricity	AC 200 - 240V, 50/60Hz
Power	< 500 W
Min. Hole Size	0.13 mm ≤
Min. Gap	0.3 mm ≤
Max. Output Size	307 × 172 × 400 mm
Mass Printing	112 ea (TD MAX: 3,000 ea) *(Implant fixture)



3D Model Layout



Actual Output

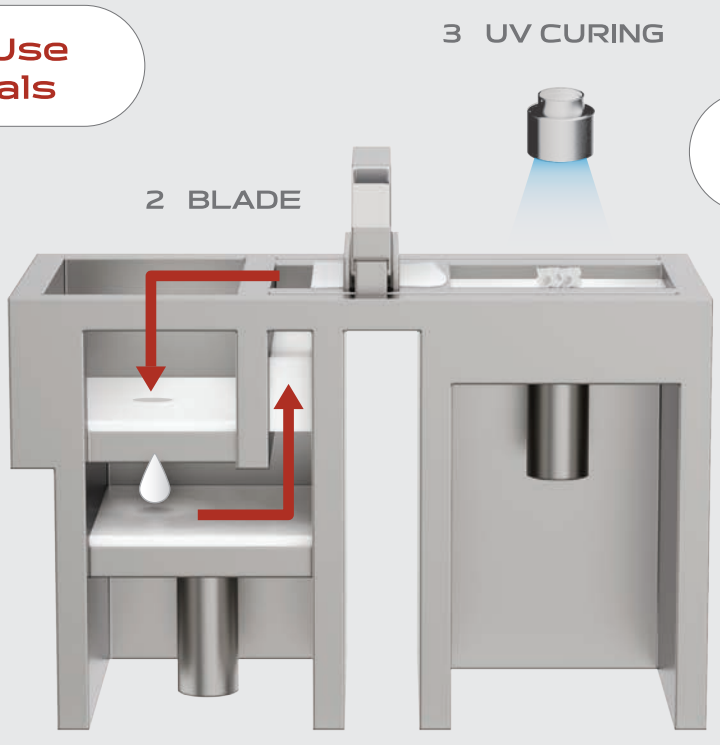


HYBRID DLP SYSTEM

PRINTING TECHNOLOGIES WITH HIGHEST EFFICIENCY

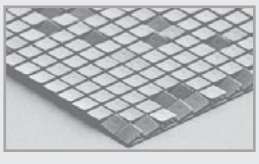
Efficient Use of Materials

Internal circulation system that allows continuous recycling 95% of ceramic materials



Full HD DLP Engine

High-resolution DLP engine for faster & more accurate application of printing layers



3D Controls' ceramic printing full-cycle production process, which guarantees a completely sintered body, can be built within 4.2m² facility. The vertical process, which is highly efficient in standardized spaces and operating personnel, can be built anywhere, regardless of space or environment, such as a lab, a research institute, or office. It can be used immediately after installation within a day.

3D Modeling 〉 3D Printing 〉 Cleaning 〉 Sintering 〉 Final Output

The automated and streamlined system is designed to allow users to easily and conveniently produce fully sintered ceramic products, unlike complex milling or CIM (mould) processes. Our systematized processes ensure efficiency and consistency in product manufacturing.

POST-PROCESSING EQUIPMENT

C1 Cleaner

Product Size	650 × 550 × 1300 mm
Cleaning Zone	610 × 350 × 400 mm
Weight	100 kg
Required Facility	Air Compressor (5~6 bar)

Circulating recycling system of cleaning agent material that allows repeated usage of the cleaning agent.

Required Configuration

R1 Furnace

Product Size	325 × 390 × 530 mm
Sintering Room	110 × 110 × 100 mm
Weight	34 kg
Required Facility	Air Duct

Fine control of sintering conditions through 12 sections of Sinterting schedule. Remote operation and diagnose available.

Required Configuration

P1 Polisher

Product Size	1500 × 920 × 1500 mm
Barrel Capacity	3.5 L x 4 ea
Electricity	AC 220V, 50/60 Hz
Spin Speed	Max 170 RPM
Required Facility	Air Compressor (5~6 bar)

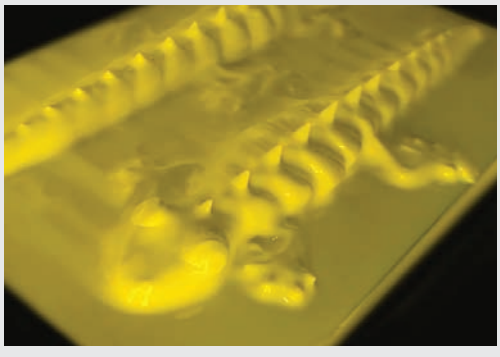
Sandblasting and barrel rotating polishing method to smoothen out ceramic output surface. Remote operation and diagnose available.

Optional Configuration

BEFORE & AFTER

- Securing dimensional accuracy and yield by completely removing uncured slurry residue from the surface and interior after 3D printing.
- Preventing microstructural damage that may occur during manual cleaning by using a high-pressure cleaner.

Cleaning Process



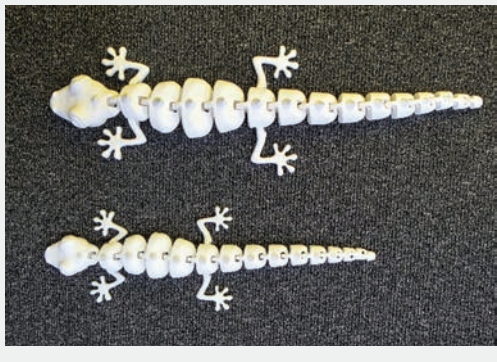
without Cleaner

with Cleaner

- Built-in 12-step temperature control parameters in 0.01°C increments optimized for dedicated slurries.
- Stable shrinkage rate management and network system monitoring & remote control of all processes.

Sintering Process

Before Sintering
(Green body)



After Sintering
(Green body vs Sintered body)

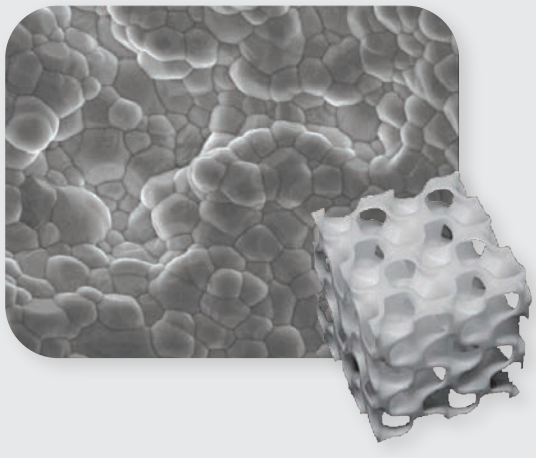
- The surface of ceramic components is precisely machined to achieve a surface roughness level that meets the final specifications.
- A two-step polishing precess using a dedicated abrasive ensures a smooth, shiny surface quality.

Polishing Process

Before Polishing

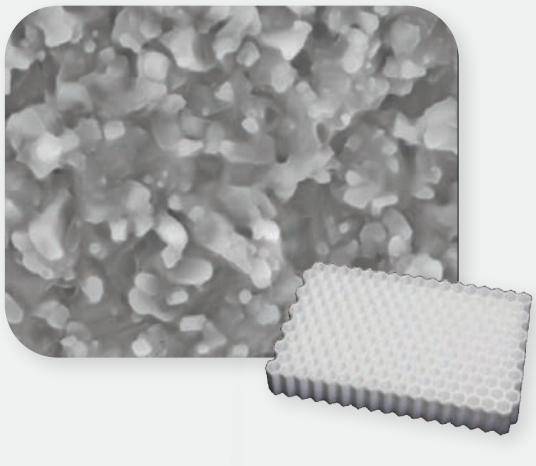
After Polishing

CURRENTLY AVAILABLE
MATERIALS



ZIRCONIA

- Theoretical density [g/cm3] 6.05
- Max Working Temperature [°C] 1,450
- Compressive Strength [MPa] 2,300
- 4-point Bending Strength [MPa] 850 – 950
- Hardness [Vickers HV0.5] 14.0



ALUMINA

- Theoretical density [g/cm3] 3.98
- Max Working Temperature [°C] 1,600
- Compressive Strength [MPa] 2,000 – 2,600
- 4-point Bending Strength [MPa] 420 – 440
- Hardness [Vickers HV0.5] 13.5

CHANGE IN CERAMIC MOLDING METHODS & NEEDS TO NEW MATERIALS

Material enables innovation. Manufacturing proves it.

CONVENTIONAL

Injection Molding

CNC Milling

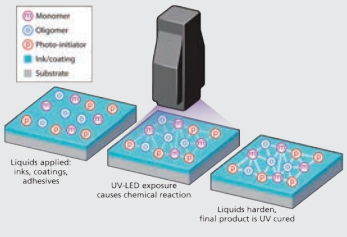
and etc...

NEW

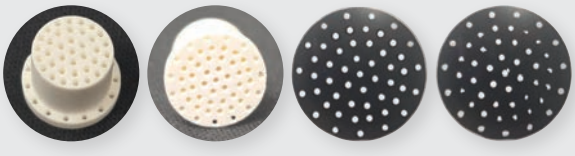
PARADIGM SHIFT of CERAMIC PROCESSING METHOD

Proactive Printing Material Development Needed to Revolutionize Ceramic Manufacturing

Material Provided



Curing Test



Optimizing Materials for Precision and Tolerances

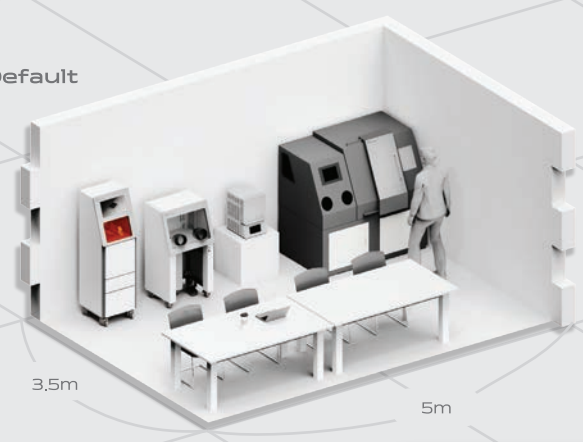
MASS PRODUCTION

LAB

TD6 1 R0 1 1
C1 1 P1 1 8h /1day

92 pcs/day

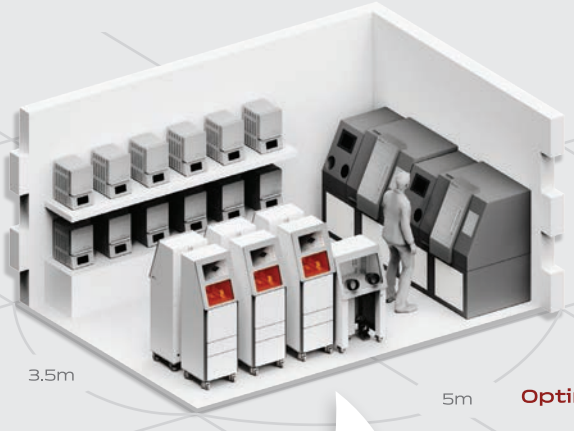
Default



FARM

TD6 6 R0 12 1
C1 1 P1 2 8h /1day

552 pcs/day



Optimized

The most efficient unit that can produce 1,656 smart rings per day based on three shifts and 33,120 per month through the FARM system

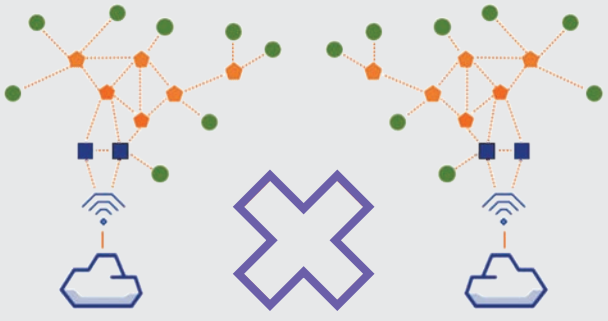
= 11,040 ea/mo.
x 3 = 33,120 ea/mo.

The Optimized Configuration ensures The Same Productivity Wherever you are, and Simultaneous Production is also possible.
(Network Printing)

SAME PRODUCTIVITY

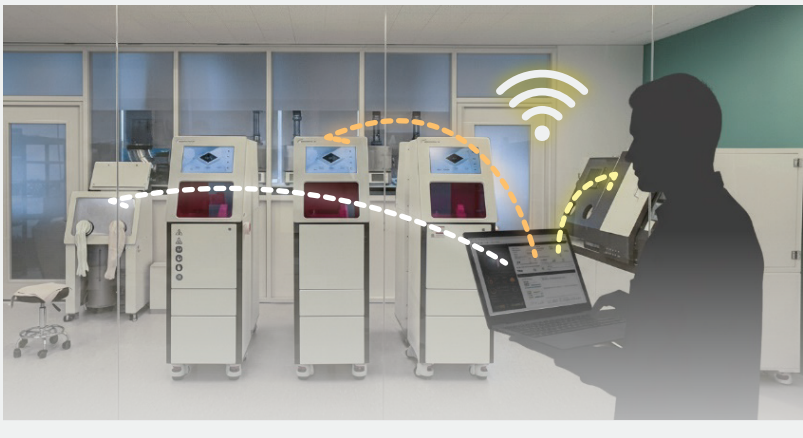
"We, 3D Controls, plan to develop more high-performance ceramic 3D printers and products in the future, and we are always open to your cooperation and suggestions."

DEVELOPMENT OF NETWORK MASS PRODUCTION SYSTEM



Contemporary Ceramic Printing Systems

Closed Structural Problems due to The Absence of Communication Systems



Establishment of A Modular Mass-produced Ceramic Printing System

Networked Ceramic Printing Mass Production System

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