

# ***Graphy***

*3D Print the World with Graphy's Solutions*

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# HISTORY ABOUT GRAPHY INC

## 2017

01. Founded Graphy Inc.
06. Established Annex Research Institute
09. Certified as a Venture Company
11. Registered Factory

## 2018

01. Registered Patent: Digital Castings Using 3D Data
04. Granted [Technology Evaluation Outstanding Company T-5 Certification] for Modifying casts and splints with 3D data
09. Granted [Technology Evaluation Outstanding Company T-5 Certification] for 3D cast fabrication solutions  
**Won Grand Prize in the preliminary round of the Challenge K-Startup Innovation League**

## 2019

02. **Signed Agreement with JW Holdings Healthcare to jointly develop new materials**
04. Developed Tera Harz 3D printing material
05. Certified [Technology Evaluation Outstanding Company T-4] Recognized for Cast and Splint Manufacturing with 3D Data
12. **Selected Outstanding Invention by Korea Invention Promotion Association for UV post-curing**  
Received Minister of SMEs and Startups Award and Korea ICT Agency Award  
Acquired ISO 13485 Quality Management System certification

## 2020

01. Registered Patent: Light-curable polymer compositions for 3D printers
02. Launched World's First Dental Crown Resin for 3D printing
04. Acquired CE Class II and FDA certification for orthodontic appliance resin
05. Selected as First Penguin Startup by Credit Guarantee Fund
07. Expanded Agencies in over 10 countries
11. Selected among Material, Parts, and Equipment Startups 100 Established Corporate Research Center in Ulsan
12. Acquired MFDS Certification for medical device manufacturing (THD)

## 2021

02. Established Subsidiary [Digital Graphy]
06. Certified as INNO-BIZ (Technology Innovation Small Business) Designated as Export-Promising SME
07. Acquired CE Class I certification for photopolymerizable dental resins (THD & TFDH)
09. Obtained FDA 510(k) clearance for Dental Crown Resin (TC-80DP)
11. Signed Supply Agreement with Henry Schein, the world's #1 dental distributor
12. **Won Excellence Award at 3D Printing Competition & ICT Promotion Agency Award**  
**Acquired New Excellent Product certification for orthodontic resin with UV-curable polyurethane acrylate**

## 2022

02. **Obtained MFDS medical device certification for TFDH(Flexible Denture) MFDS**  
The patent for "3D printable light-curable compositions for manufacturing transparent aligners" was registered in USA.

08. Obtained FDA 510(k) clearance for TFDH (Flexible Denture)
11. **Obtained FDA 510(k) clearance for Tera Harz Clear as resin for orthodontic aligners**  
**Selected World's Next Greatest Product 2022 (Resin for orthodontic aligners)**  
**Received Minister of Science, ICT, and Future Planning Award**

## 2023

03. Held Graphy Shape Memory Aligner Symposium
04. Participated in AAO; signed multiple global-scale supply contracts Appointed to National Projects totaling USD 4 million
06. **Recognized as [Technology Growth Excellent Company TI-2] by Korea Rating & Data for development and manufacturing technology of shape memory aligner using UV curable 3D printing resin**
11. Obtained FDA 510(k) clearance for BR-23 (Class II)
12. **Awarded 3 Million Dollar Export Tower on Trade Day**  
Named Outstanding Export Company at Hi Seoul Enterprise Festival  
**Awarded Industrial Technology Development Merit Organization by Prime Minister**  
Awarded by Minister of Trade, Industry & Energy for Contribution to Convergence Manufacturing  
Received Future Creative Enterprise Management Award & Minister of Employment and Labor Award(Sponsored by the Ministry of Science and ICT, Ministry of Employment and Labor, hosted by Money Today)  
Ranked 1st in Outstanding Brand of the Year (sponsored by JoongAng Ilbo)

## 2024

01. Certified Tera Harz Clear (TC-85DAC) by Japan's PMDA (Pharmaceuticals and Medical Devices Agency)
02. **Won IR52 Jang Young-Sil Award for 3D printing resin for orthodontic devices**
03. Obtained FDA 510(k) clearance for Tera Harz Clear (TA-28, TR-07) Selected for 2024 Ministry of Trade, Industry & Energy Export Voucher Program
04. **Recognized as Top 1,000 Globally Competitive Small Enterprises (Top 1,000 Companies Worldwide)**
05. Selected for 2024 AI Voucher Support Program Certified Tera Harz Clear (TA-28, TR-07) by Korea's MFDS
07. Registered Tera Harz Clear (TC-85DAC, TC-80DP, BR-23) with ARTG (Australia)
08. Registered Tera Harz Clear (TC-85DAC, TC-80DP, BR-23) with Taiwan TFDA Selected as 2024 Seoul Innovative Small Enterprise  
**Achieved "A" Grade in technology evaluations by Korea Exchange**
09. Certified Tera Harz Clear (TA-28, TR-07) by Japan's PMDA
12. Registered Tera Harz Denture (TFDH) with Taiwan TFDA  
Awarded Certificate of Commendation from Korea Technology Finance Corporation  
**Awarded 5 Million Dollar Export Tower**

## 2025

01. Licensed Tera Harz Clear by Health Canada
03. Registered Tera Harz Clear (TA-28) with Taiwan TFDA
05. Licensed Tera Harz Denture (TFDH) by Health Canada  
**Awarded Industrial Service Medal (CEO Un-seob Sim)**
08. Listed on KOSDAQ



## The World's First Direct 3D-Printable Shape Memory Aligner®

Graphy Inc. is a premier manufacturer and supplier of advanced photopolymer resins for 3D printing, with a strong portfolio of domestic and international patents. We specialize in high-performance materials for diverse industries, with a primary focus on the dental sector. Our products have been clinically validated and are recognized worldwide for their superior quality, significantly enhancing our global market presence.

We are especially renowned for pioneering the world's first Shape Memory Aligner® for orthodontics, as well as top-grade permanent materials for Crown & Bridge applications (TC-80DP / BR-23). All Graphy resins are non-toxic, hypoallergenic, and biocompatible, designed to meet the highest standards of strength, heat resistance, and precision. This expertise streamlines and shortens dental manufacturing workflows by overcoming complex preparation and post-processing challenges.

Graphy also leads the industry with the world's first 3D-printable, shape-memory transparent orthodontic material. Our comprehensive portfolio of photopolymer resins supports a wide range of applications, including flexible dentures, permanent prostheses, denture bases, models, and surgical guides. These material solutions are further enhanced by our advanced software and hardware.

With a strong commitment to continuous innovation, Graphy is dedicated to developing specialized materials for the dental and biotech industries—setting new industry standards and driving the future of market innovation.

### Formlabs Form 4B



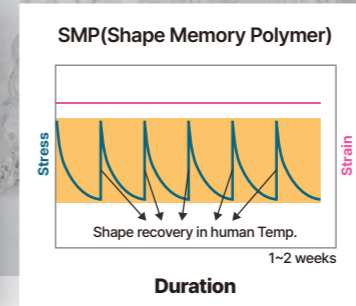
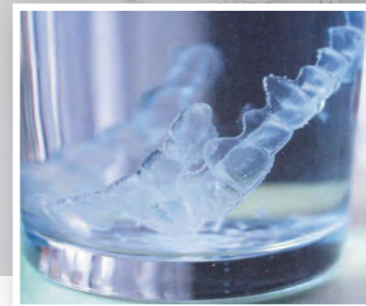
### UNIZ UBEE



### AccuFab CEL



## Shape Memory Aligner® (Tera Harz Clear)

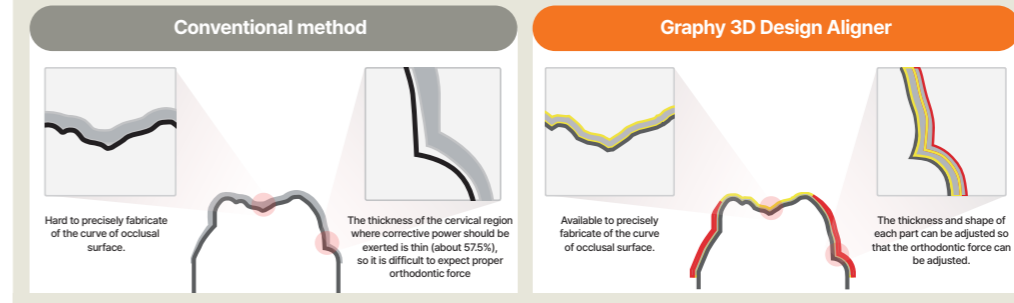


This innovative Graphy's world-first directly 3D printable material for aligners breaks the preexisting concept of clear aligners and offers a significant advancement in digital dentistry.

### Proven clinical effectiveness in the thesis

The mechanical properties of the 3D printed Shape Memory Aligner® using the Tera Harz Clear showed no change in properties even one week after the patient wore it.

(quoted from: European Journal of Orthodontics, 2021, 1-5/ doi: 10.1093/ejo/cjab022 / University of Zurich/ Dr. Nearchos Panayl)



Properties	Unit	TC-85	TA-28	TR-07	Remark
Color	-	Clear	Clear	Clear	
Density	g/cm <sup>3</sup> @ 25°C	1.061 ± 0.02	1.091 ± 0.02	1.064 ± 0.02	
Viscosity	cps @ 25°C	800 ± 200	700 ± 200	800 ± 200	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	≥ 98	≥ 98	
Shore Hardness (D)	-	≥ 85	≥ 85	≥ 85	
Flexural Strength	MPa	≥ 50	≥ 70	≥ 60	ISO 20795-2
Flexural Modulus	MPa	≥ 1500	≥ 2000	≥ 1600	ISO 20795-2
Water Solubility	mm/min	2.0	≤ 0.5	1.0	ISO 20795-2

# Permanent C&B (TC-80DP)



Tera Harz C&B (TC-80DP) is a permanent crown and bridge resin featuring the world's highest flexural strength (ISO-10477).

It has obtained KFDA Class II and CE Class II-a medical device certifications, affirming that its physical properties and stability meet international standards.

TC-80DP is an internationally validated 3D printing material, designed for both temporary and permanent treatments—from single crowns to full-arch bridges.

Properties	Unit	TC-80DP	Remark
Color	-	A1, A2, A3, B1, OM1	
Density	g/cm <sup>3</sup> @ 25°C	1.076 ± 0.02	
Viscosity	cps @ 25°C	2000 ± 300	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	
Shore Hardness (D)	-	≥ 90	
Bi-axial Flexural Strength	MPa	≥ 350	ISO 6872
Flexural Strength	MPa	≥ 160(ISO Standard), 220(Graphy Standard)	ISO 10477
Flexural Modulus	MPa	≥ 3500(ISO Standard), 4500(Graphy Standard)	ISO 10477
Water Sorption	mm <sup>3</sup> /mm <sup>3</sup>	18.9	ISO 10477
Water Solubility	mm <sup>3</sup> /mm <sup>3</sup>	0.5	ISO 10477

# Permanent C&B (BR-23)

Opaque, A/B/C/D shade



Courtesy of Chang-Woo Woo, MSE, PhD  
YONSEI UNIVERSITY COLLEGE OF DENTISTRY, SEOUL, KOREA



Courtesy of Dr. Katsuhiro Asaka, DDS, PhD, Japan  
Doctor of Dentistry, Matsudo School of Dentistry, Japan University



This is the ideal material for implant and natural tooth prosthetics, especially for bridges of six or more teeth. It was developed as a resin for permanent dental crowns and long-span bridges, and has been rigorously verified for physical stability, with MFDS Class II and CE Class II-a certifications.

The material provides a soft, stable bond with high elongation, making it suitable for both temporary and permanent use across all indications, including full-mouth bridges. Specifically designed for 3D printers, it ensures precision and reliability.

With exceptional flexural strength and abrasion resistance, it delivers outstanding durability. Its balanced absorbency and solubility make it ideal for long-term prosthetic applications. Furthermore, it offers wide applicability validated across various treatments.

Key Features: Non-toxic and biocompatible / High bending and tensile strength / Suitable for long bridges, crowns & bridges, inlays, onlays, veneers, and more

Properties	Unit	BR-23	Remark
Color	-	A, B, C, D, OM	
Density	g/cm <sup>3</sup> @ 25°C	1.015 ± 0.02	
Viscosity	cps @ 25°C	1300 ± 300	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	
Shore Hardness (D)	-	≥ 85	
Flexural Strength	MPa	≥ 100	ISO 10477
Flexural Modulus	MPa	≥ 2500	ISO 10477
Water Sorption	mm <sup>3</sup> /mm <sup>3</sup>	10	ISO 10477
Water Solubility	mm <sup>3</sup> /mm <sup>3</sup>	0.2	ISO 10477

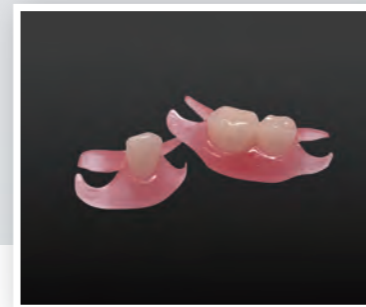
# Denture Base (THD)



Tera Harz Denture Base (THD) is a removable denture material that delivers exceptional patient satisfaction with outstanding color stability and durability against water sorption. When combined with Graphy's permanent materials, THD provides superior strength, stability, and esthetics, ensuring optimal results for patients.

Properties	Unit	THD	Remark
Color	-	Magenta	
Density	g/cm <sup>3</sup> @ 25°C	1.063 ± 0.02	
Viscosity	cps @ 25°C	1500 ± 300	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	
Shore Hardness (D)	-	≥ 85	
Flexural Strength	MPa	≥ 140(ISO Standard), 190(Graphy Standard)	ISO 20795-1
Flexural Modulus	MPa	≥ 3000(ISO Standard), 3900(Graphy Standard)	ISO 20795-1
Water Sorption	mm/mm	15.9	ISO 20795-1
Water Solubility	mm/mm	0.6	ISO 20795-1

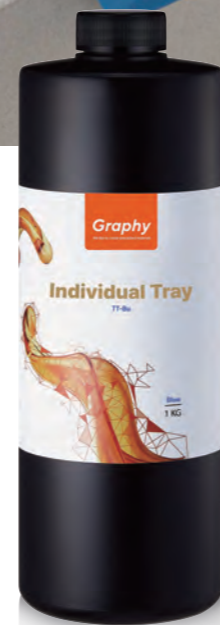
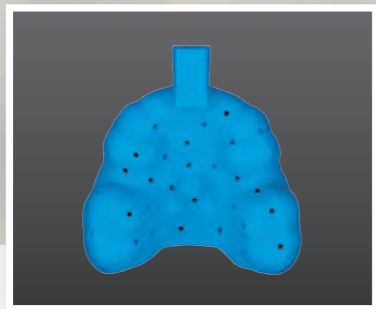
# Flexible Denture (TFDH)



Tera Harz Flexible Denture (TFDH) is a resin designed for flexible, removable partial dentures. It is ideal for filling gaps caused by missing teeth and for preventing adjacent teeth from shifting. Its soft, flexible composition ensures comfortable wear and easy removal. When combined with Graphy's permanent materials, TFDH provides excellent strength, stability, and esthetics, delivering optimal results for patients.

Properties	Unit	TFDH	Remark
Color	-	Magenta	
Density	g/cm <sup>3</sup> @ 25°C	0.998 ± 0.02	
Viscosity	cps @ 25°C	700 ± 200	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	
Shore Hardness (D)	-	≥ 80	
Flexural Strength	MPa	≥ 110	ISO 20795-1
Flexural Modulus	MPa	≥ 2800	ISO 20795-1
Water Sorption	mm/mm	10.8	ISO 20795-1
Water Solubility	mm/mm	1.4	ISO 20795-1

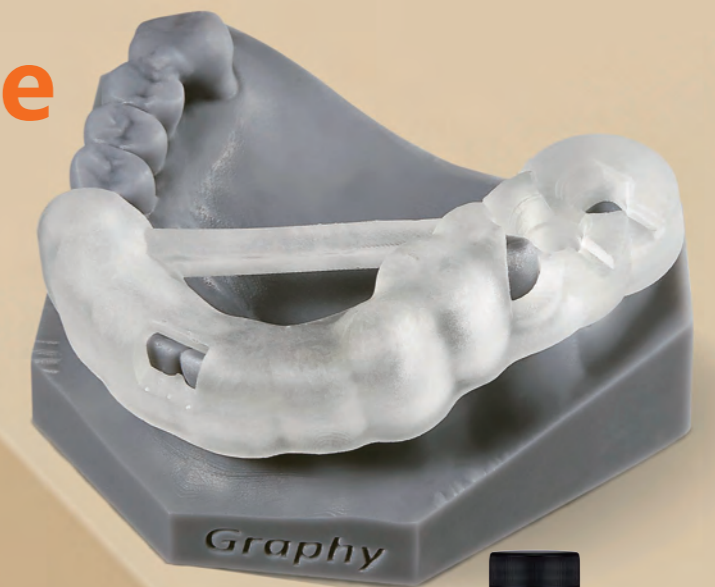
# Individual Tray (TT-Bu) (Blue)



The Individual Tray (custom tray) is designed for prosthodontic treatments that demand highly accurate impressions, such as implant restorations, complete dentures, and partial dentures. Using CAD software, trays can be digitally designed to precisely match each patient's oral anatomy. With 3D printing, they can be fabricated quickly and accurately. This digital workflow enhances impression accuracy, allows for easy reproduction and modification, and reduces material waste, making it highly cost-efficient. Compared with manual fabrication, it ensures consistent quality, improving both clinical efficiency and patient satisfaction.

Properties	Unit	TT-Bu	Remark
Color	-	Blue	
Density	g/cm <sup>3</sup> @ 25°C	1.04 ± 0.02	
Viscosity	cps @ 25°C	600 ± 100	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	
Shore Hardness (D)	-	≥ 80	
Flexural Strength	MPa	≥ 80	ISO 20795-1
Flexural Modulus	MPa	≥ 2000	ISO 20795-1
Water Sorption	mm <sup>3</sup> /mm <sup>3</sup>	13.7	ISO 20795-1
Water Solubility	mm <sup>3</sup> /mm <sup>3</sup>	1.6	ISO 20795-1

# Surgical Guide (SG-100)



Graphy's Surgical Guide Resin (SG-100) enables surgeons to implement optimized designs exactly as planned for each patient case. It ensures drilling at the correct angle and depth, enhancing surgical accuracy and reliability. What makes SG-100 unique is that no drill sleeve is required—the guide hole itself is engineered to be both precise and tight. With a Heat Distortion Temperature (HDT) exceeding 130°C, SG-100 is fully compatible with autoclave sterilization. In addition, its transparency can be adjusted according to the chosen post-processing method.

Properties	Unit	SG-100	Remark
Color	-	Clear	
Density	g/cm <sup>3</sup> @ 25°C	1.110 ± 0.02	
Viscosity	cps @ 25°C	600 ± 200	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	
Shore Hardness (A)	-	≥ 90	
Flexural Strength	MPa	≥ 110	ISO-20795-1
Flexural Modulus	MPa	≥ 2500	ISO-20795-1
Tensile Strength	MPa	≥ 60	ASTM D638
Tensile Modulus	MPa	≥ 2500	ASTM D638
Elongation	%	≥ 10	ASTM D638
Impact Strength	J/m <sup>2</sup>	≥ 3000	ASTM D256
Water Sorption	mm <sup>3</sup> /mm <sup>3</sup>	16.2	ISO-20795-1
Water Solubility	mm <sup>3</sup> /mm <sup>3</sup>	0.6	ISO-20795-1

# Model (S-100M/S-200M)



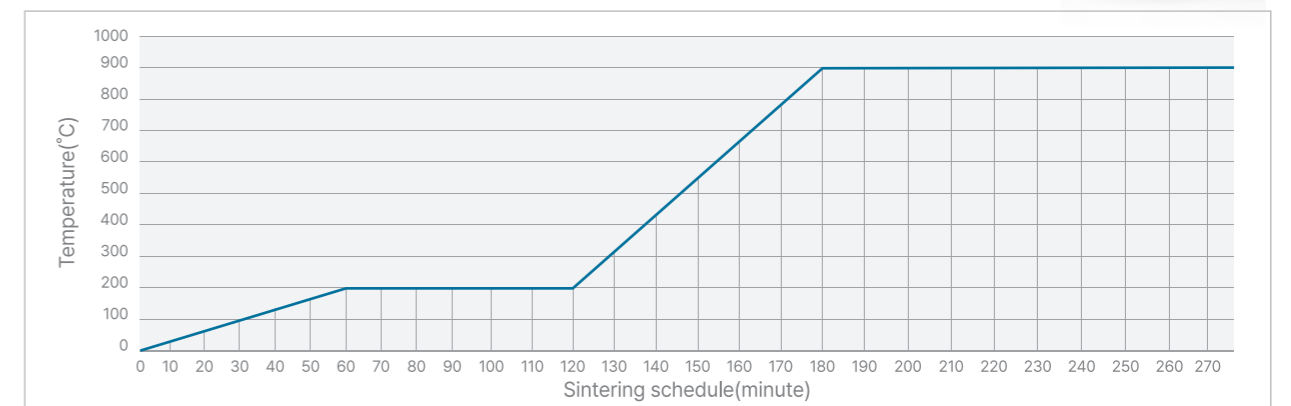
One of the earliest and most common 3D printed creations used in dentistry is the dental model. With the S-100M and S-200M material, traditional impressions are no longer necessary, as the intraoral scanner can be used to acquire oral data and the model can be created directly by the printer. This saves dentists time and money in transferring a patient's intraoral image to its making, and the simplicity of the process brings a more accurate intraoral image as the fewer the steps of the whole process, the less the error is.

Properties	Unit	S-100M	S-200M	Remark
Color	-	Grey, Beige	Yellowish, Gray, Beige, White, Light Gray	
Density	g/cm <sup>3</sup> @ 25°C	1.120 ± 0.02	1.116 ± 0.02	
Viscosity	cps @ 25°C	600 ± 100	950 ± 100	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	≥ 98	
Shore Hardness (D)	-	≥ 90	≥ 90	
Flexural Strength	MPa	≥ 110	≥ 160	ASTM D790
Flexural Modulus	MPa	≥ 2500	≥ 3500	ASTM D790
Tensile Strength	MPa	≥ 75	≥ 100	ASTM D638
Tensile Modulus	MPa	≥ 2500	≥ 3500	ASTM D638
Elongation	%	≤ 10	≤ 5	ASTM D638
Impact strength	J/m <sup>2</sup>	≥ 2100	≥ 3000	ASTM D256 (Notched)

# Castable (SC-130)



Metal prostheses have a long tradition in dentistry. Traditionally, they were fabricated using wax as a casting material—a process that demanded significant time, effort, and highly skilled personnel. With the advent of 3D printing in dentistry, castings can now be designed digitally through 3D modeling and produced with exceptional precision and accuracy. This innovation enables faster, more efficient, and more reliable castings than ever before.



Properties	Unit	SC-130	Remark
Color	-	Green	
Density	g/cm <sup>3</sup> @ 25°C	1.110 ± 0.02	
Viscosity	cps @ 25°C	100 ± 50	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	

# Mouth Guard (TE-151)



The demand for flexible, elastic materials in dental applications—such as mouthguards—continues to grow. Conventional options, like silicone, are mostly off-the-shelf and lack customization. Since dentistry requires highly personalized products, traditional customization is often time-consuming and costly. With 3D printing technology, mouthguards can now be produced with personalized designs, significantly reducing both time and cost. TE-151 was developed to make this innovation possible.

Properties	Unit	TE-151	Remark
Color	-	Clear	
Density	g/cm <sup>3</sup> @ 25°C	1.063 ± 0.02	
Viscosity	cps @ 25°C	1300 ± 200	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	
Shore Hardness (A)	-	≥ 75	
Tensile Strength	MPa	≥ 10	ASTM D638
Elongation	%	≤ 110	ASTM D638
Water Sorption	≡/≡	37.9	ASTM D638
Water Solubility	≡/≡	3.4	ASTM D638

# Gingiva Mask (TE-600)



Tera Harz Gingiva Mask is a soft, flexible material designed to replicate the natural feel of gum tissue. It is ideal for use in combination with implant models, offering excellent elasticity and tear resistance while realistically reproducing the look and feel of gingiva. With its high accuracy, dental technicians can easily print gingiva masks that fit perfectly to dental models. Its smooth surface finish also ensures optimal esthetic results.

Properties	Unit	TE-600	Remark
Color	-	Red	
Viscosity	cps @ 25°C	400 ± 100	BrookField
Solid Content	% @ 80°C × 1h	≥ 98	
Shore Hardness (A)	-	≥ 50	
Tensile Strength	MPa	≥ 1.5	ASTM D638
Tear Strength	kN/m	≥ 6	ASTM D638
Elongation	%	≥ 150	ASTM D638

# Formlabs Form 4B

## Core Features



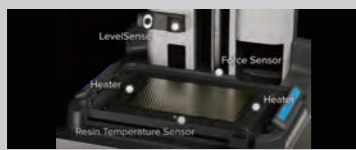
### Low Force Display™

Minimizes peel forces for faster print cycles, better surface quality, and extended tank life—ideal for precise, high-volume dental production



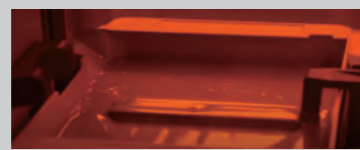
### Backlight Unit

60 high-power LEDs with collimating lenses deliver uniform, high-intensity light for consistent layer curing—ensuring accuracy, detail, and repeatability across the entire build area



### Smart Sensor System

Six sensors—including Z-axis force and ultrasonic resin sensing—automatically optimize print conditions for consistent, high-quality results



### Advanced Resin Handling

Infrared heating and continuous mixing maintain resin between 25-45°C, ensuring optimal flow, easier handling, and excellent accuracy and print quality



Description	Specification
Printing Speed	Avg.40mm/h   Max.100mm/h
Printing Technology	Low Force Display™(LFD)
Build Volume	200×125×210mm(W×D×H)
XY Resolution	50µm
Layer Thickness (Z Resolution)	25-200µm
Support	Auto-generated / Light-touch removal
Dimension / Weight (incl. pkg.)	398×367×554mm / 18.3kg
Working Temperature	Auto-heats resin to25-45°C(77-113 °F), depending on material
Power Requirement	100-240VAC, 4.8A   50/60Hz, 480W
Z-Axis Leveling Method	Auto-calibrated platform
Connectivity	Wi-Fi (2.4 and 5 GHz);IEEE 802.11 b/g/n/ac, WPA/WPA2) Ethernet (1000 Mbit), USB-C 2.0
Optical System	60uniform-wavelength LEDs, 405nm, 16mW/☰
Control Panel	7" touchscreen, PreForm software
Product Features	Fast, versatile, biocompatible materials, intuitive use

# Formlabs Form 4BL

## Core Features



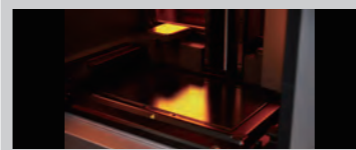
### Low Force Display™

Minimizes peel forces for faster print cycles, better surface quality, and extended tank life—ideal for precise, high-volume dental production



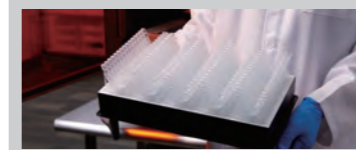
### Advanced Backlight Unit

Features 145 high-intensity LEDs and collimating lenses, delivering uniform, ultra-high-power light for rapid and precise resin curing across the entire build platform



### Smart Sensor & Resin Control System

Six sensors, including Z-axis force and resin level detection, work with IR heating and continuous mixing to maintain ideal print conditions—ensuring stable flow, easy handling, and high-quality results



### Large-Format Optimized

Infrared heating and continuous mixing maintain resin between 25-45°C, ensuring optimal flow, easier handling, and excellent accuracy and print quality



Description	Specification
Printing Speed	Avg.24mm/h   Max.80mm/h
Printing Technology	Low Force Display™(LFD), Masked Stereolithography(MSLA)
Build Volume	353×196×350mm(W×D×H)
XY Resolution	46µm with anti-aliasing
Layer Thickness (Z Resolution)	25-200µm
Support	Auto-generated / Light-touch removal
Dimension / Weight (incl. pkg.)	66.4×52.8×79.4cm / 58.5kg
Working Temperature	Auto-heats resin to 25-45 °C (77-113 °F), depending on material
Power Requirement	100-240VAC, 9A   50/60Hz, 900W
Z-Axis Leveling Method	Printer Leveling Sensor (auto)
Connectivity	Wi-Fi (2.4&5 GHz), Ethernet (1000 Mbit), USB-C 2.0
Optical System	145LEDs, 405nm, 16mW/☰
Control Panel	7" touchscreen, PreForm software
Product Features	Fast, accurate, wide material compatibility via Open Material Mode

# UNIZ NBEE

## Core Features



**High Efficiency Liquid Cooling**  
Maintains system temperature below 40°C



**Micro-Stereo Composite**  
Patent low force peel technology



**High Power Collimated Light**  
16mW/cm<sup>2</sup> high power, 95% Uniformity



**Resin Temperature Control System**  
Maintain optimal reaction Temp




Description	Specification
SMA Printing Speed	50µm-1Hour   100µm-30minutes
Printing Technology	LCD Stereo lithography Technloly
Build Volume	192×120×180mm
XY Resolution	49.8µm
Layer Thickness (Z Resolution)	10~200µm(25, 50, 100µm Recommended)
Support	UNIZ Smart Support Technology
Dimension / Weight (incl. pkg.)	380×380×1230mm / 60kg / 85kg
Working Temperature	18~28°C
Power Requirement	110V/60Hz 6A   220V/50Hz 3A
Z-Axis Leveling Method	Leveling Using A4 Paper
Connectivity	USB Flash Drive, Wi-Fi, Ethernet
Optical System	4th Generation Collimated Light Source
Control Panel	7" Touchscreen
Product Features	Strong durability, Compatible with over 100 types of materials

# UNIZ UBEE


## Core Features



**Liquid Cooling Empowered High Power Photocuring System (LEPH 2.0)**  
Light Processing Unit 6 (LPU 6)



**Smart Sensor and Control System (SSCS)**  
FSD Module- 4 Z-Axis Force Sensor integrated into the LPU panel



**Smart Identification System (SIS)**  
With NFC and ID Sensing Board Inside



**Industrial Robot - KK Linear Module**  
High-Precision Ball Screw, Servo Motor Control System



Description	Specification
SMA Printing Speed	50µm-1Hour   100µm-30minutes
Printing Technology	Masked Stereolithography(MSLA)
Build Volume	198×124×180mm
XY Resolution	34µm
Layer Thickness (Z Resolution)	10~200um(25, 50, 100µm Recommended)
Support	UNIZ Smart Support Technology
Dimension / Weight (incl. pkg.)	383×425×712mm / 34kg / 56kg
Working Temperature	18~28°C
Power Requirement	110V/60Hz 6A   220V/50Hz 3A
Z-Axis Leveling Method	Leveling Using Built-in Sensors
Connectivity	USB Flash Drive, Wi-Fi, Ethernet
Optical System	5th Generation Collimated Light Source
Control Panel	7" Touchscreen
Product Features	Excellent performance in terms of high resolution and precision High Performance and Cost Efficiency

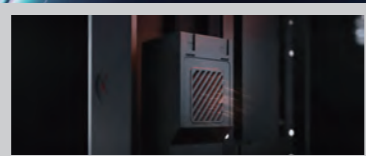
# AccuFab CEL

## Core Features



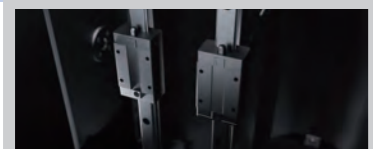
### Light Board Uniformity with High Accuracy

AccuFab-CEL achieves high printing accuracy, reaching  $\pm 35\mu\text{m}$ .



### Real-Time Cabin Environment Detection and Heating

If the temperature is too low, the cabin will be heated up before printing begins.



### Enhanced Z Axis Movement System

Increased speed of the Z-Axis accelerates the printing process.



### One-click lock

Provides clear visibility of the status.



Description	Specification
SMA Printing Speed	50 $\mu\text{m}$ -1Hour20minutes   100 $\mu\text{m}$ -45minutes
Printing Technology	Light Board Uniformity with High Accuracy
Build Volume	194 $\times$ 120 $\times$ 180mm
XY Resolution	35 $\mu\text{m}$
Layer Thickness (Z Resolution)	50~100 $\mu\text{m}$
Support	Professional Slicing Software
Dimension / Weight (incl. pkg.)	360 $\times$ 360 $\times$ 530mm / 19kg / 30kg
Working Temperature	20~35 $^{\circ}\text{C}$
Power Requirement	110V~240V / 360W
Z-Axis Leveling Method	Leveling using custom paper
Connectivity	USB, Wi-Fi, Ethernet
Optical System	Parallel light (resolution5760 $\times$ 3600)
Control Panel	5" Touchscreen
Product Features	Using a ceramic platform for precision printing and excellent biocompatibility Three types of resin tanks available for different purposes

# Tera Harz Spinner Centrifuge

- Fast & Efficient Resin Removal
- Powerful Yet Noiseless Spin
- Strong, Practical, and Durable Design

Description	Specification
Size	390 $\times$ 450 $\times$ 430(Wdh)(mm)
Weight	6.5kg
Capacity	max.16aligners
Time	Spinning time adjustable (5 minutes for aligners)
Functions	Digital display   Internal heating during operation   Safety Stops   Simple and efficient maintenance



# Tera Harz Care Ultrasonic cleaner & warmer

- Ensures hygiene and cleanliness of Shape Memory Aligners<sup>®</sup>
- Supports comfortable wear and easy removal
- Simple, user-friendly operation
- Compact and portable design

Description	Specification
Size	$\Phi$ 115 $\times$ 103mm
Weight	325g
Capacity	200ml
Maximum Temperature	50 $^{\circ}\text{C}$
Time	5minutes (Auto power off)
Functions	Ultrasonic   warmer + Ultrasonic   Auto power off



# Tera Harz Cure

## 3<sup>rd</sup> Generation Nitrogen Curing Machine

The world's first UV curing device to achieve 100% polymerization conversion of materials

- 280,000 mJ/cm<sup>2</sup>, 1,000 mW/cm<sup>2</sup> (based on 5-minute curing) delivering maximum intensity and shade consistency with high-energy UV
- Stores up to 5 curing conditions per material
- Adjustable light levels for each printed material (Level 1-5)
- 360° UV irradiation with optimal LED arrangement for uniform curing
- Safety cooling system based on LED temperature control
- Maximum curing size: Ø180 mm with 360° turntable

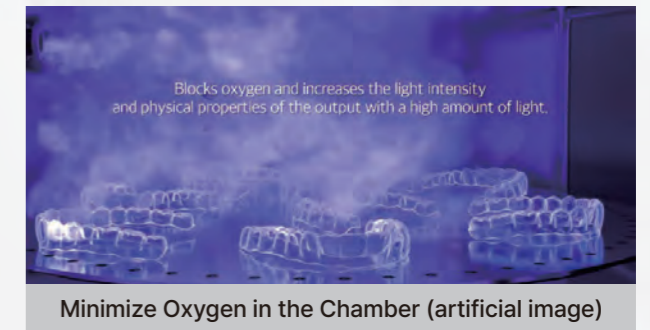


## Tera Harz Cure: Benefits of Nitrogen Curing

- |   |  |
|---|--|
| <p><b>01 Improved mechanical strength and color consistency</b><br/>Blocking oxygen during curing increases strength and ensures uniform color across prints.</p> | <p><b>02 Prevention of water absorption and chemical leaching</b><br/>Oxygen-free curing enhances biocompatibility and durability by blocking moisture penetration and chemical release.</p>                         |
| <p><b>03 Reduced stickiness and residual polymers</b><br/>Improves biocompatibility, surface stability, and overall user comfort.</p>                             | <p><b>04 Better surface quality of printed parts</b><br/>Produces smoother surfaces and a precise fit comparable to that of metal crowns.</p>  |
| <p><b>05 Higher accuracy and reproducibility</b><br/>Delivers consistent output quality across repeated prints.</p>   | <p><b>06 Greater operational efficiency and convenience</b><br/>The all-in-one nitrogen injection system enables fully automated operation without external setup—more cost-effective than conventional systems.</p> |

Description	Specification
Display	7.9" TFT Touch LCD
LED Wavelength	405nm
LED Power	200W
Curing Chamber	Ø180×650mm
Dimension (Weight)	275×310×310mm(8.5kg)
UV Energy Density	280,000 mJ/☐
Irradiance of UV (5minute-curing based)	1,000 mW/☐

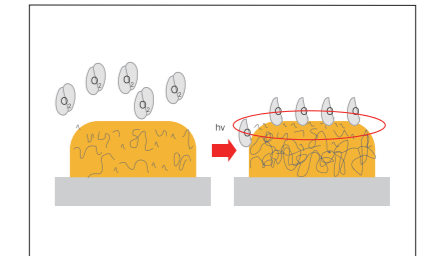
UV Energy density Irradiance of UV Light (UV Meter LS128 / 5 minutes)	180,000 mJ/cm <sup>2</sup> 600 mW/cm <sup>2</sup> (Lv.1)	205,000 mJ/cm <sup>2</sup> 700 mW/cm <sup>2</sup> (Lv.2)	230,000 mJ/cm <sup>2</sup> 800 mW/cm <sup>2</sup> (Lv.3)	255,000 mJ/cm <sup>2</sup> 900 mW/cm <sup>2</sup> (Lv.4)	280,000 mJ/cm <sup>2</sup> 1,000 mW/cm <sup>2</sup> (Lv.5)
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## Oxygenation Reactions on Surfaces

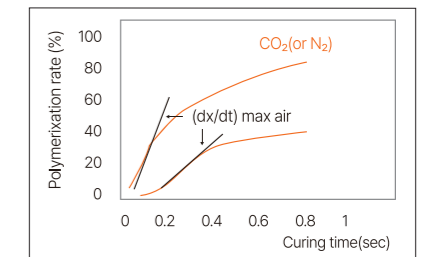
Surface tack generation caused by oxygen

UV curing uses radical polymerization resins, where polymerization is initiated by radicals generated through UV irradiation. If these radicals combine with atmospheric oxygen before bonding occurs, oligomers or monomers may remain on the surface, causing surface tack.



## Polymerization Rate Based on Atmosphere

Polymerization rates increase in CO<sub>2</sub> and N<sub>2</sub> atmospheres compared to air.



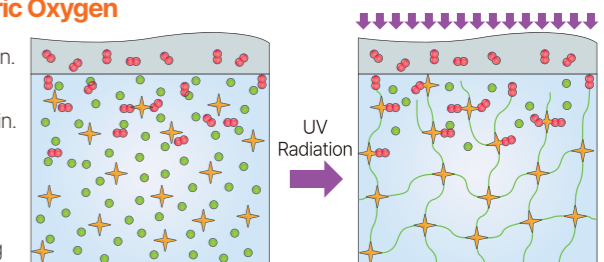
Quoted from "Optimize the UV Curing Process," Science & Technology, 2008

## Inhibition of Free Radical Polymerization by Oxygen

### Photopolymerization in the Presence of Atmospheric Oxygen

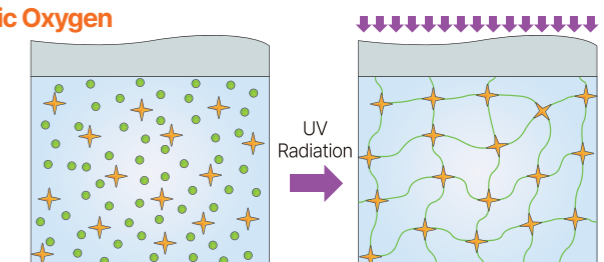
When exposed to light, photocurable resins undergo a radical reaction. In the presence of oxygen, radicals react with oxygen, which inhibits radical polymerization of the monomers and oligomers within the resin. This results in unreacted monomers and a structure with low cross-linking density.

The surface of the cured resin, with its low cross-linking density, can absorb water in moist environments (e.g., the oral cavity), leading to haze formation and elution of unreacted material.



### Photopolymerization in the Absence of Atmospheric Oxygen

Without oxygen interference, radicals are more likely to stabilize and react effectively. The cured resin forms a strong structure with high cross-linking density, making it highly stable against moisture. As a result, there is minimal unreacted monomer and very little risk of degradation or exfoliation due to the strong cross-linked network.

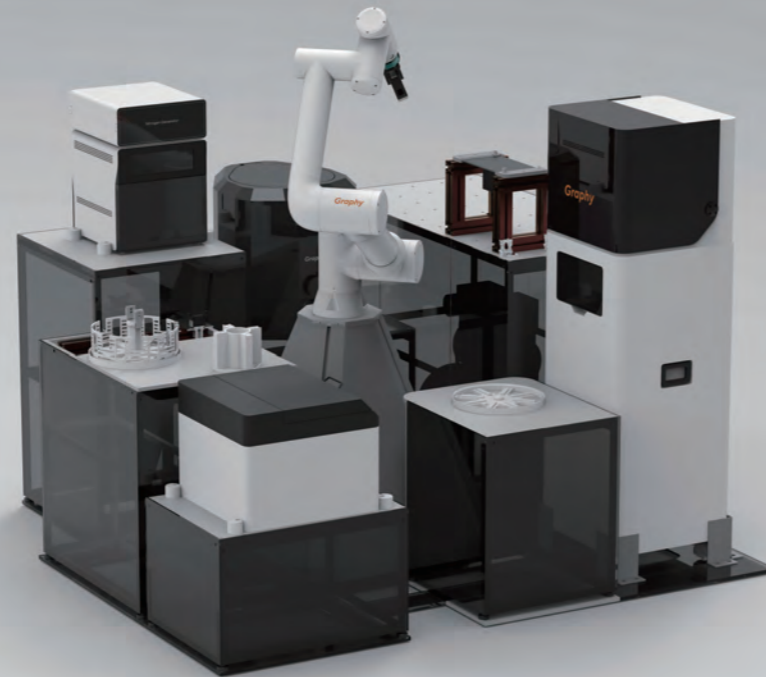


Mandal, Joydeb, Kaihuan Zhang, and Nicholas D. Spencer. "Oxygen inhibition of free-radical polymerization is the dominant mechanism behind the "mold effect" on hydrogels." Soft Matter 17, no. 26 (2021) : 6394-6403.



# Tera Harz Smart Robot

The most advanced all-in-one device for Shape Memory Aligner® manufacturing.



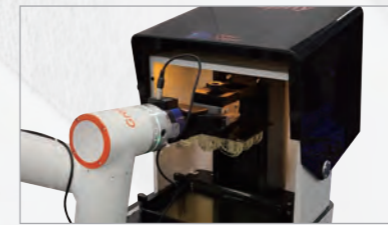
## Advantages of Tera Harz Smart Robot

This system is more than just automation—it represents the advancement of the world's first Shape Memory Aligner® with a state-of-the-art robotic platform for greater excellence and convenience. With Graphy's Tera Harz Smart Robot, the Shape Memory Aligner® becomes even more efficient, precise, and reliable.

- |  |  |
|--|--|
| <p><b>01 Competitive excellence in technology</b><br/>Delivers consistent product quality, 24-hour operation, and optimized automated reprogramming.</p> | <p><b>02 Improved outcomes</b><br/>Enhances treatment results through sophisticated operation.</p> |
| <p><b>03 Economic benefits</b><br/>Reduces consumables, accelerates treatment, and boosts productivity.</p>  | <p><b>04 Time efficiency</b><br/>Enables same-day, convenient treatment.</p>                       |

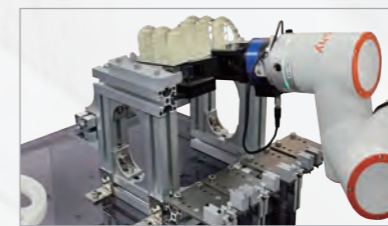
Description	Specification
Product Name	Tera Harz Smart Robot (THSR)
Model Name	R2K2U
Weight(Kg)	20Kg
Application	In-house Aligner Manufacturing (lab/clinic)
Voltage	220V(110V Compatible Module Provided)
Usage	Production Line
After Warranty Service	Video Technical Support
Type	6-axis Vertical Multi-joint
Machine type	Aligner Manufacturing Robot Arm 6 Axis
Aligner Material	Tera Harz Clear
Warranty	1 year

## Manufacturing Process of Tera Harz Smart Robot



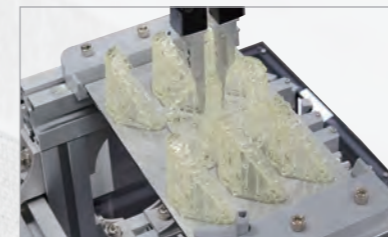
### 01 Aligner Printing

When the Tera Harz Smart Robot (THSR) picks up the pen and touches the LCD, printing begins. Once the print is complete, the printer door opens automatically.



### 02 Detach the Build Plate

The Tera Harz Smart Robot (THSR) loosens the knob securing the build plate and removes it from the printer. The plate is then flipped and mounted onto the alignment disassembly jig.



### 03 Remove the Aligner

The robot uses a tip to separate the aligner from its support. After switching to a different tip, it fully detaches the aligner. The separated aligners are then arranged and mounted onto the Spinner holder.



### 04 Resin Removal

Lift the Spinner holder and mount it onto the Spinner. Turn the digital knob to begin the de-resining process. Once complete, open the door and remove the holder.



### 05 Curing

Take each aligner from the Spinner holder and place it on the curing plate (up to 8 pieces). Lift the curing plate and position it inside the curing device. Close the door and press the LCD to start curing.

