WORLD‘S FIRST THERMOSET SOLUTION FOR SLS TECHNOLOGY

Baris Kaynak
Global Product Manager
@TIGER Coatings

Johnny Zhu
Polymer Product Line Manager
@Farsoon

A BETTER FINISH. A BETTER PRINT. FOR A BETTER WORLD.

OPEN FOR INDUSTRY.

Webinar Agenda

WORLD‘S FIRST THERMOSET SOLUTION FOR SLS TECHNOLOGY

Part 1: Thermoset SLS Machine Solution

Johnny Zhu
Polymer Product Line Manager
@Farsoon

- Farsoon - product line & core value
- Truly open SLS machine platform
- Advanced solution for material development
- Farsoon & Tiger partnership

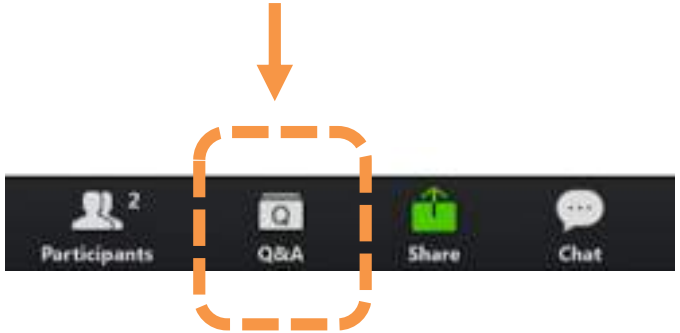
Part 2: Thermoset Material Solution

Baris Kaynak
Global Product Manager
@TIGER Coatings

- Tiger Coatings – Innovation journey
- Thermoset material: key features & advantages
- Material properties & suited industries
- Optimized material process for SLS
- Thermoset solution Eco-system

Part 3: Live Q&A Session

We would like to hear your questions!



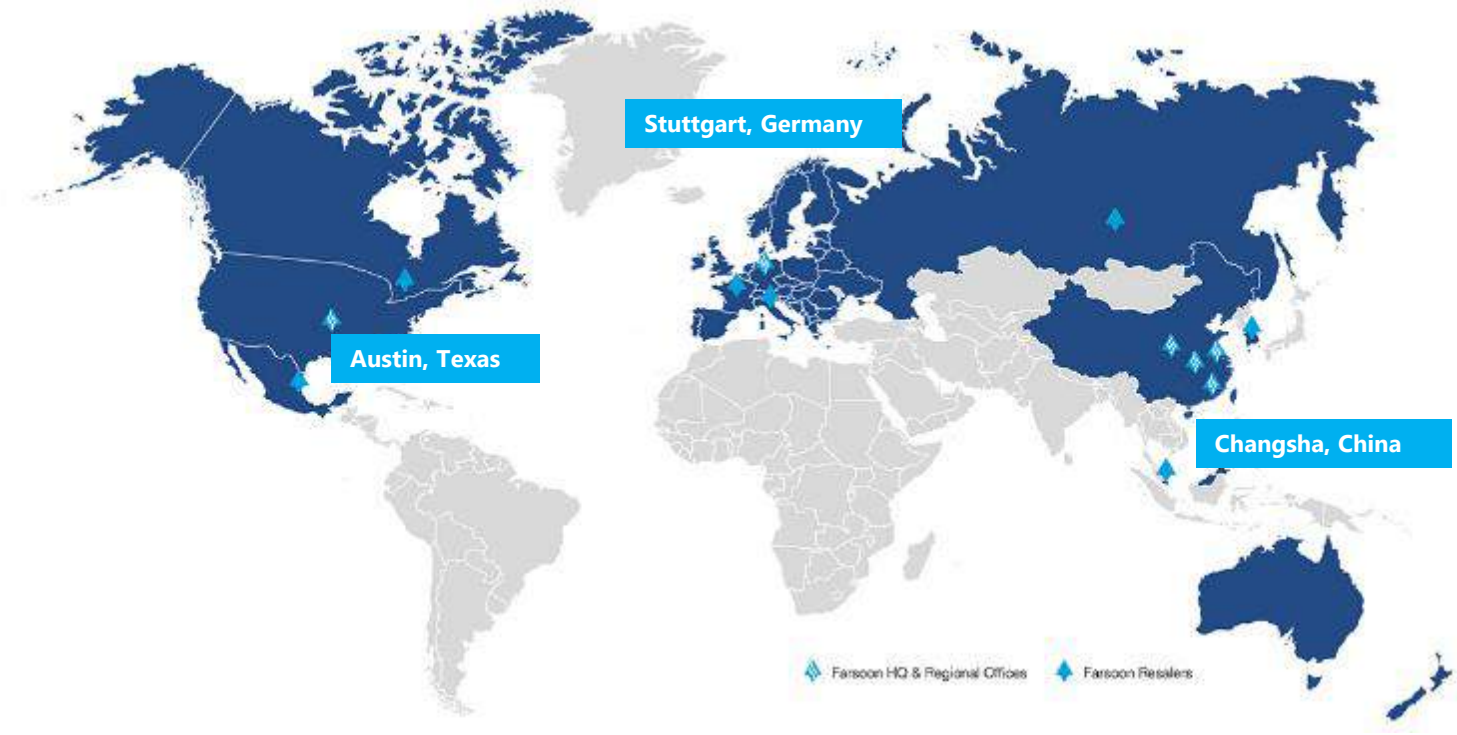
Farsoon - Global Leader of Industrial AM

25+ Years experience in industrial AM

30+ Countries with expanding global channel layout

300+ Global experts in R&D, manufacturing, support & management

500+ Farsoon system installed globally by Q1 2021



Headquarter Infrastructure

Machine Manufacturing & Application Lab

Material Factory

Farsoon – Open for Industry

Open for Industry:

- Open Materials.
- Open Parameters.
- Open Applications.
- Open Systems.

Total Industrial AM Solution:

- Established **plastic and metal** 3D printing machines.
- Customized machine solutions.
- PA1212 based & reinforced plastic powder.
- Advanced software solutions.

Core competences：

- Truly “Open” philosophy
- Comprehensive **industry know-how**
- Customer-centric support & service.
- Industrial partnerships

Farsoon’s full line of plastic laser sintering systems

Farsoon’s Know-how of Industrial AM

Material R&D, qualification, manufacturing

Parameter development

Farsoon – Industrial SLS Machine Portfolio

Max Chamber Temp.

280℃

220℃

190℃

ST252P
Laser: 1 x 100W

Flight ST252P
Fiber Laser: 1 x 300W

HT252P
Laser: 1 x 60W

Flight HT252P
Fiber Laser: 1 x 300W

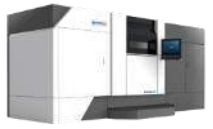
HT403P
Laser: 1 x 100W

Flight HT403P
Fiber Laser: 1 x 500W

HT1001P
Laser: 2 x 100W

eForm
Laser: 1 x 30W

HS403P
Laser: 1 x 60W

Build Volume	20L	20L	20L	72L	72L	225L
Applications	eForm	252P Series	Flight 252P Series (New)	403P Series	Flight HT403P	CAMS HT1001P
						
	➢ Educational ➢ Small batch production	➢ **Material development** ➢ Functional Parts ➢ High-temp applications ➢ Small batch production	➢ **Material Innovation** ➢ Ultra-fast processing ➢ High-temp applications ➢ Small batch production	➢ **Series Production** ➢ Functional Parts ➢ High-temp applications	➢ **Ultra-fast Production** ➢ Functional Parts ➢ Fine details ➢ High-temp applications	➢ Over-sized parts ➢ Mass Production ➢ Continuous Operation ➢ High-temp applications

Farsoon – Industrial SLS Machine Portfolio

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						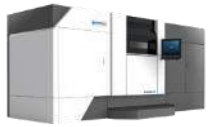
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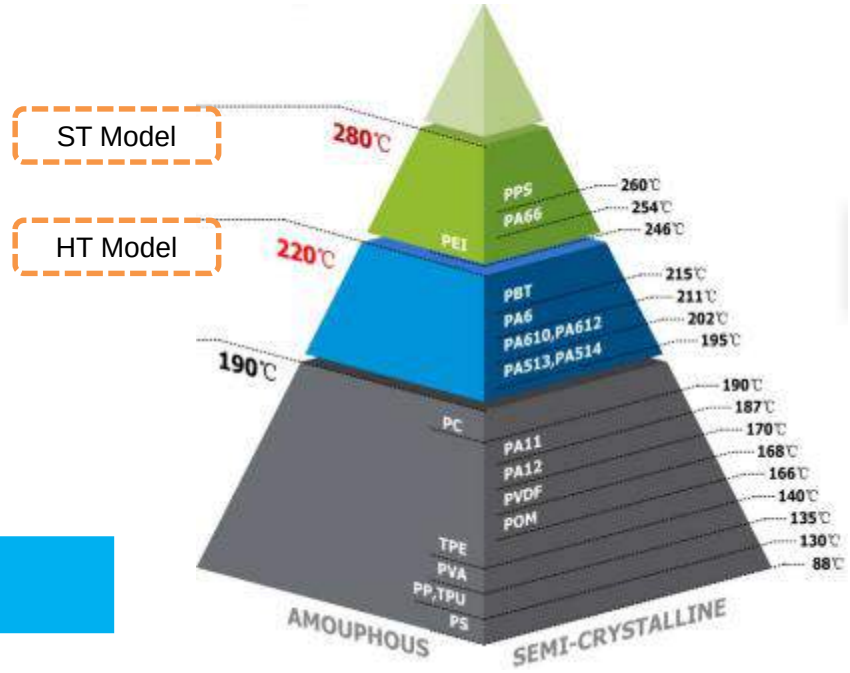
Farsoon 252P Platform

Best selling system for material R&D:

- Powerful, High-temperature material capable
- Truly open material strategy & parameter control
- Compact + accessible + economy

Build Envelope: 250*250*320mm

High-temperature capable



Over 50+ Key parameters adjustable

Farsoon 252P - Quality & Performance

Advanced thermal control:

- Even temperature distribution
- Maximize effective building area
- Uniformity of part properties
- Industry-leading build size accuracy

Fully digital optic system:

- Advanced spot size conformity control in build area
- Ultimate build speed
- Improved surface quality

Process Control:

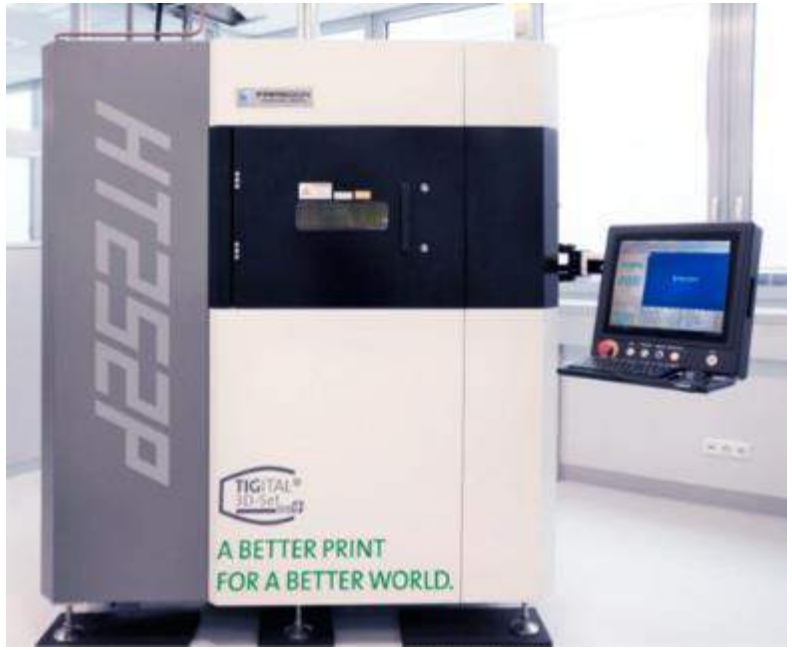
- Featured “LogView” software offers key features monitoring & recording, making it powerful tool for build process control.

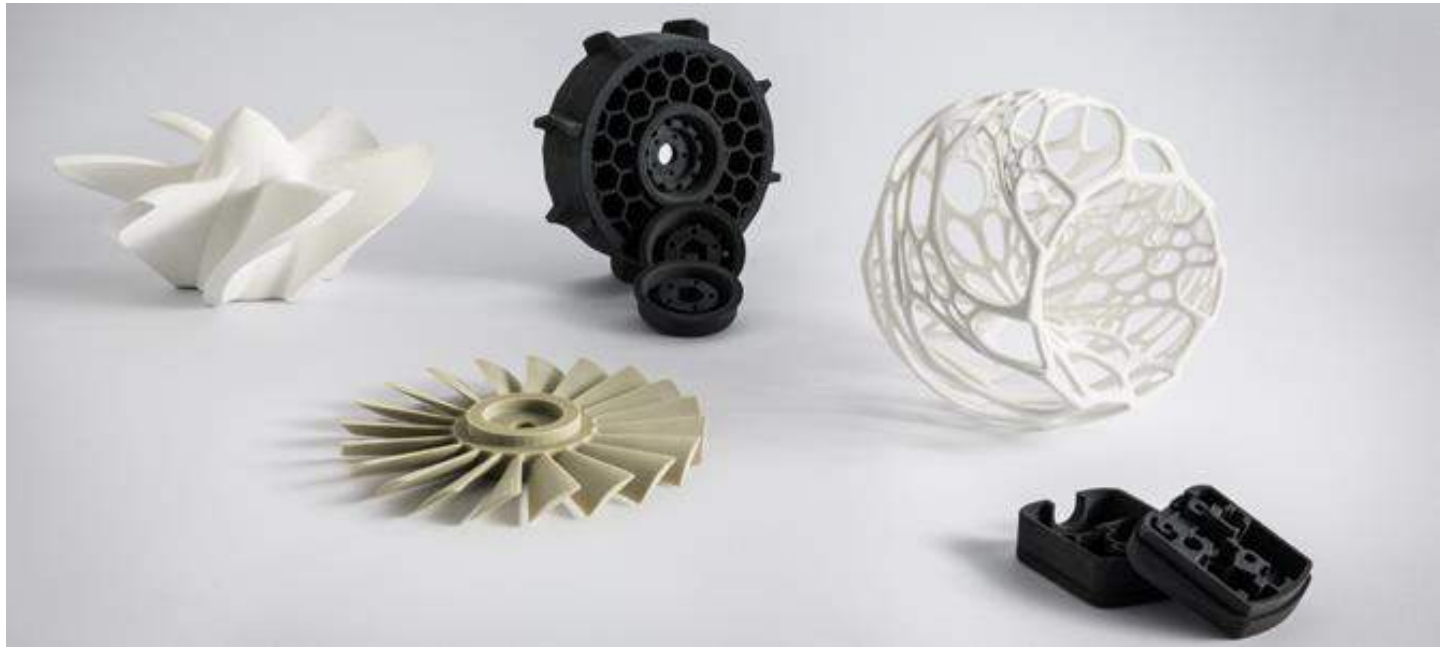
> Speed + Productivity.
> Optimal part quality.
> Economy operation cost.

Customer - centric Support & Service

Farsoon technical collaboration:

- Customized machine solution
- On-site machine installation & training
- Technical consultation on SLS process for material development
- Fast responding, professional technical support





THANK YOU

Join us and innovate with Farsoon!

400-055-2155

www.farsoon.com

Next Part

Part 2:
Thermoset Material Solution

Baris Kaynak
Global Product Manager
@TIGER Coatings

Who is TIGER

Family

Owned company

40+

countries and regions worldwide network

8

Production plants worldwide

3

R&D centers worldwide

1,300+

total employees worldwide

90 years

of manufacturing expertise

€ 309

million consolidated group sales

Key accreditations
ISO 9001 | ISO 14001
IATF 16949

TIGER Innovation Journey

TIGER Drylac® Powder Coatings

Innovative Powder Coatings for any application

TIGITAL® Inks

Industrial Ink for Digital Printing application

TIGITAL® Tattoo

Revolutional Toner system for any application

TIGITAL® 3D-Set

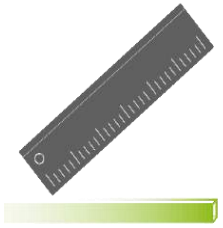
Customized Thermoset 3D Print Materials

Additive Manufacturing

Main Challenges of SLS 3D Printing

- **Properties**

- **Design**



- **Financial**

- **Productivity**

- **Customization**

Why & How we are working together?

Ecosystem which unlocks the full potential of SLS 3D print

TIGITAL® 3D-Set

Material Database

Process Parameter

Material Formulation

R&D

Surface Finishing

Customisation

Commercialisation

Customer

Be part of our Ecosystem

Machine Development

Open System

Process Control

Application Support

Technical Support

FARSOON TECHNOLOGIES

Process Parameter

Open Platform

Iterative Kaizen Process to improve

Design → Material→ Process

Industrial production of functional SLS 3D printed parts for your application

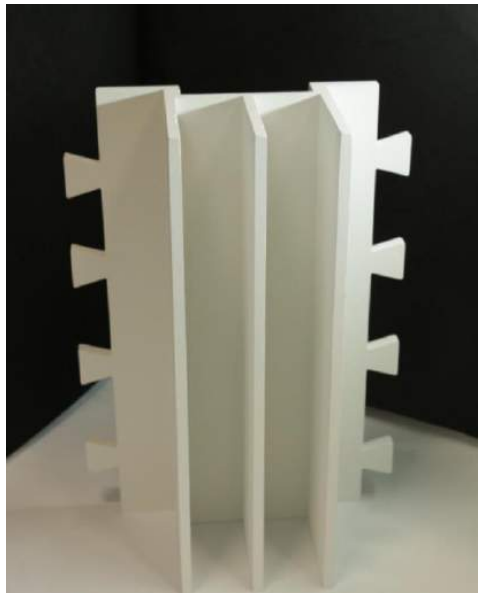
Iterative Kaizen Process to improve

Design → Material→ Process

TIGITAL 3D-Set Materials

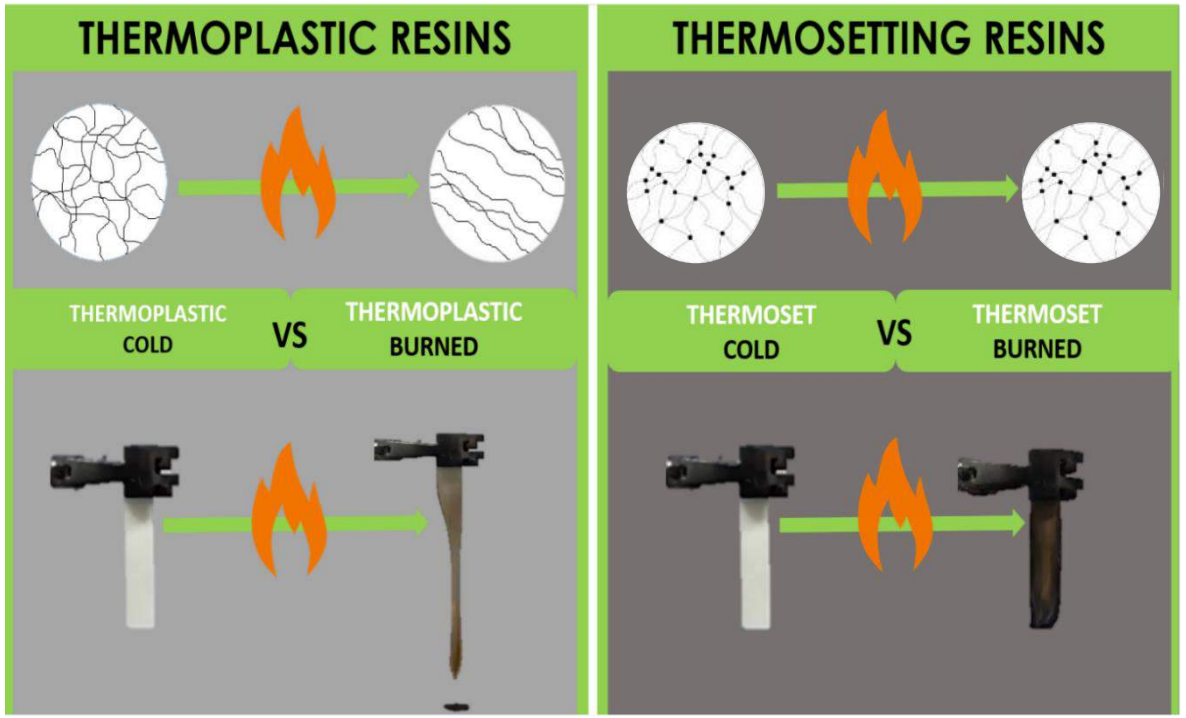
We want to provide you with answers on

- What Thermoset 3D-printing materials are
- How Thermoset Material can provide the answer
- What can be the advantages for your task
- Why you should use these materials



Thermoplastic vs Thermoset

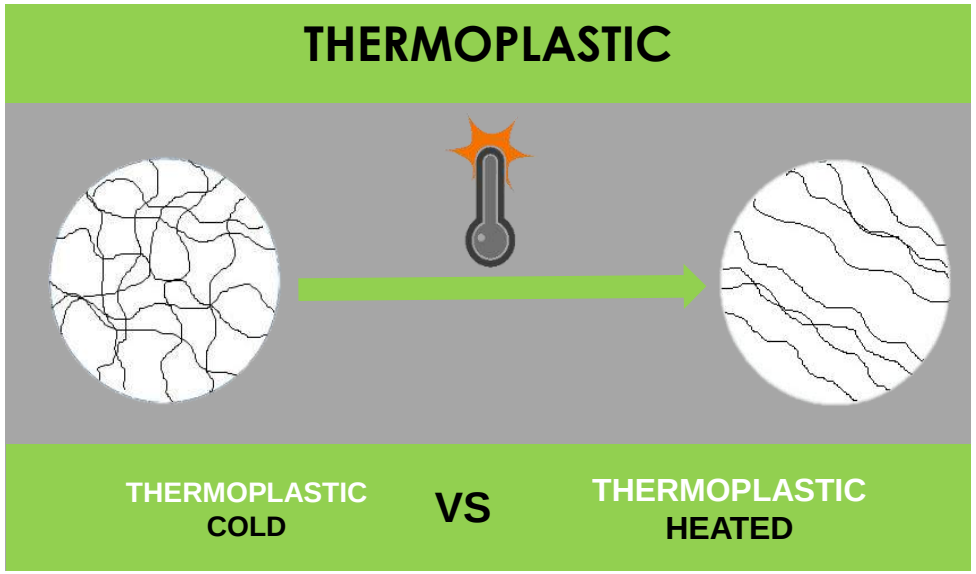
Thermoset	Thermoplastic
• Resistant to high temperature • High flexible property design • Outstanding dielectric strength • High chemical resistance • High mechanical property • Excellent aesthetic finish	• Can melt if heated • Hard crystalline • High-impact resistance • Remolding/reshaping • Properties can vary with humidity • High creep behaviour

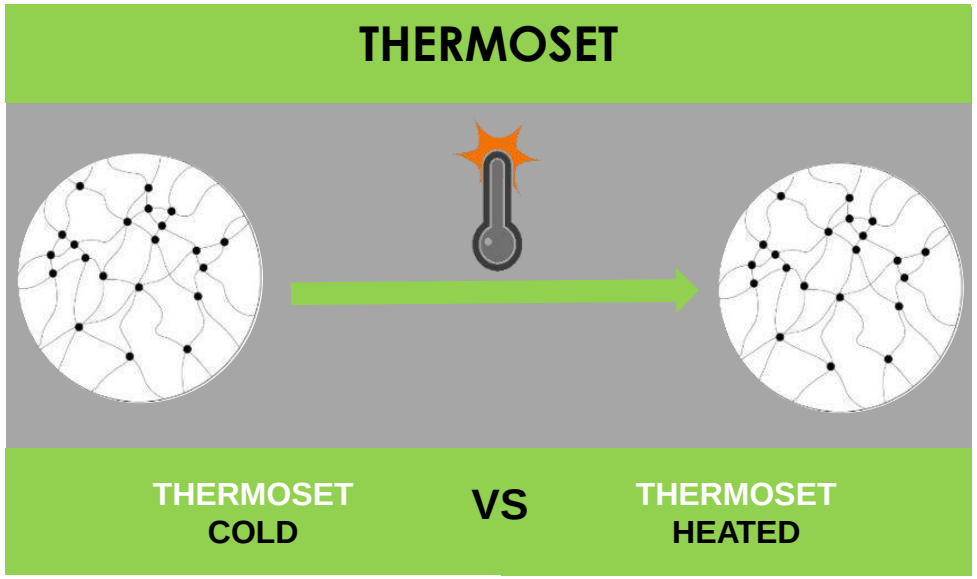


Both systems have their advantages and disadvantages and consequently also different areas of application

TIGITAL 3D-Set Properties

Excellent **High Temperature Performance**





- Due to the three-dimensional network of bonds, thermoset materials keep their shape at high temperature and do not melt
- High dimensional stability thanks to low thermal expansion coefficient

TIGITAL 3D-Set Properties

Enhanced **Mechanical Properties**

➢ **Due to their enhanced mechanical PropertiesThermoset materials are used in different industries!**

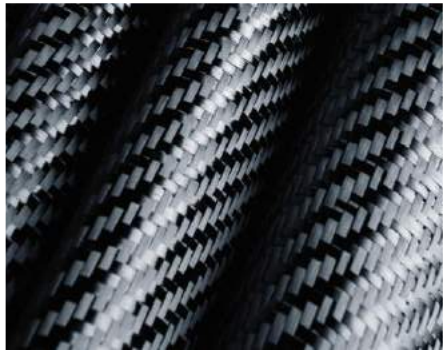
Aerospace

Mechanical Advantages of TIGITAL 3D-Set

- High abrasion resistance
- High creep resistance
- High dimensional stability under extreme load

Automobile

Composite Materials



Electrical industry

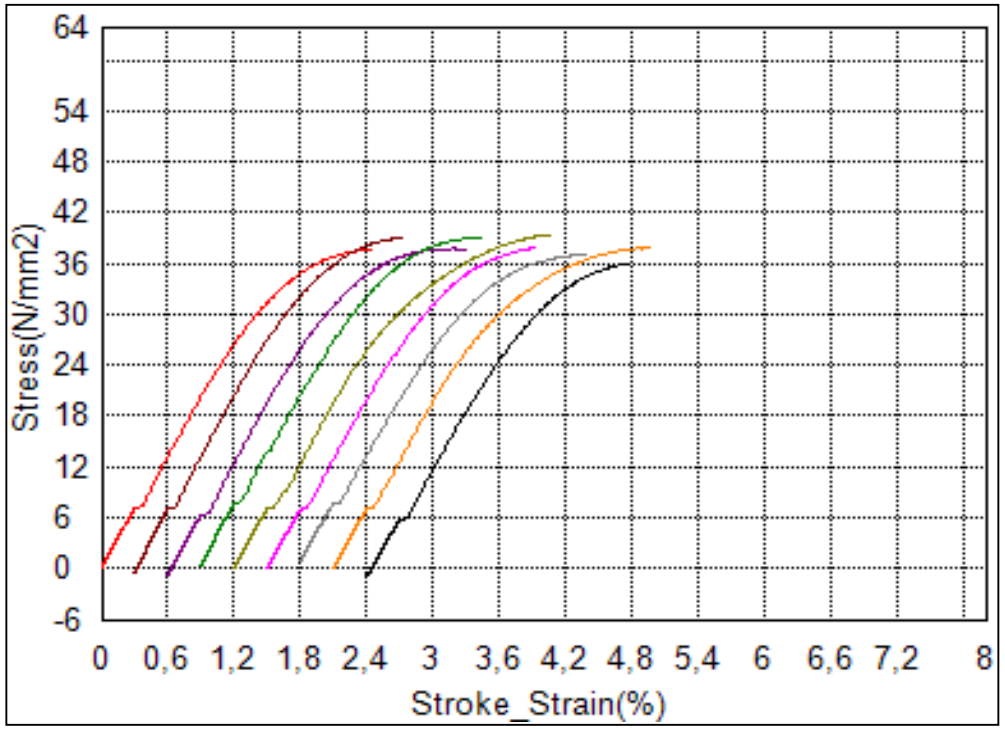
TIGITAL 3D-Set Properties

How to find the right property profile?

Thermosets can be brittel with a tensile strain <3%!

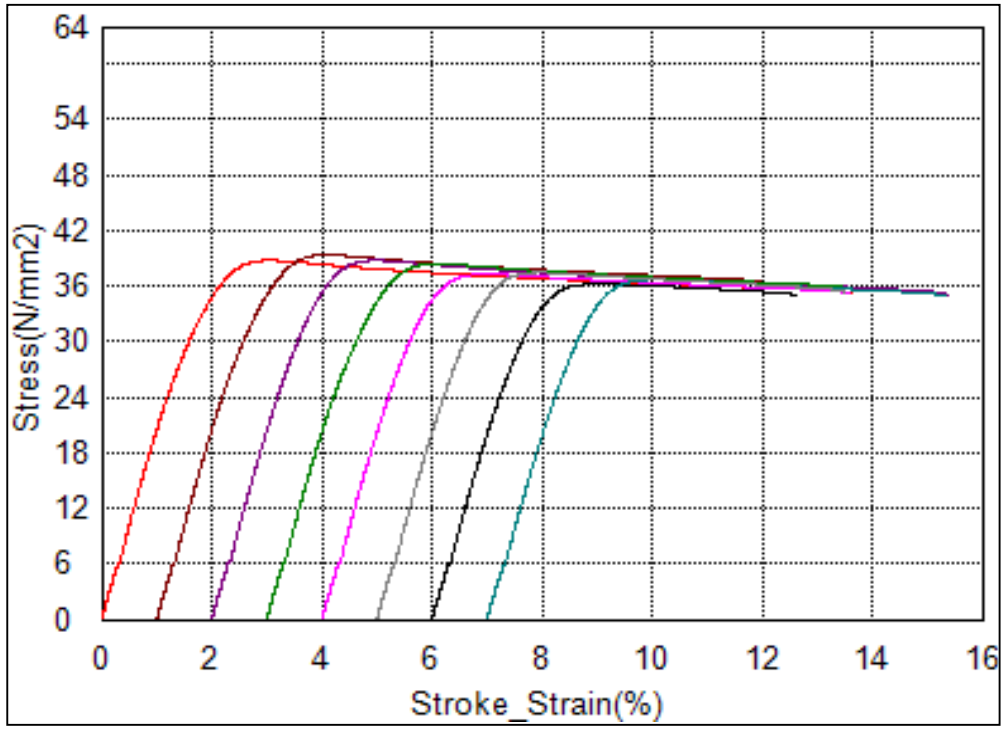
Main mechanical properties

- E-Modulus >2000 MPa
- Tensile strenght > 35 MPa



TIGITAL 3D-Set Properties

Adjustable **mechanical properties on Thermosets**



Increased Flexibility

- Tensile strain: >8%
- E-Modulus: > 2000 MPa
- Tensile strenght: >35 MPa

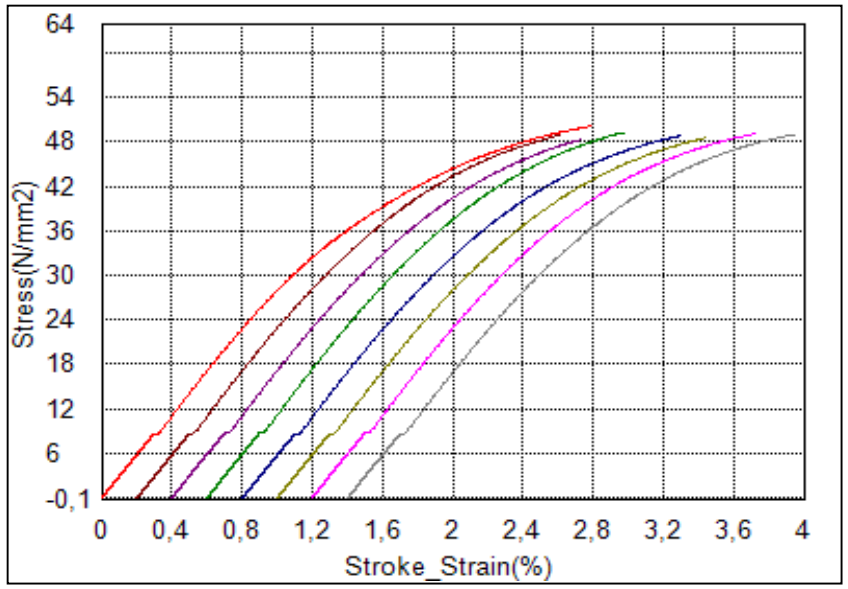
Mechanical properties can be adjusted on chemical base by net-density

TIGITAL 3D-Set Properties

Use of **fillers and fibres in polymer matrix**

Usage of fillers and fibres can inpoove the mechanical properties

- Freedom by choosing organic and anorganic filles



Usage of glass and carbon fibres (content <10%) were tested !

TIGITAL 3D-Set Properties

Adjustable high **Flame Retardancy**

TIGITAL 3D-Set offers flame retardant Materials with

- Low smoke formation
- No polymer melt dripping
- Self-extinguishing behavior

Flame retardant Materials are required in different industries

➢ **Automobile**

➢ **Rail transport**

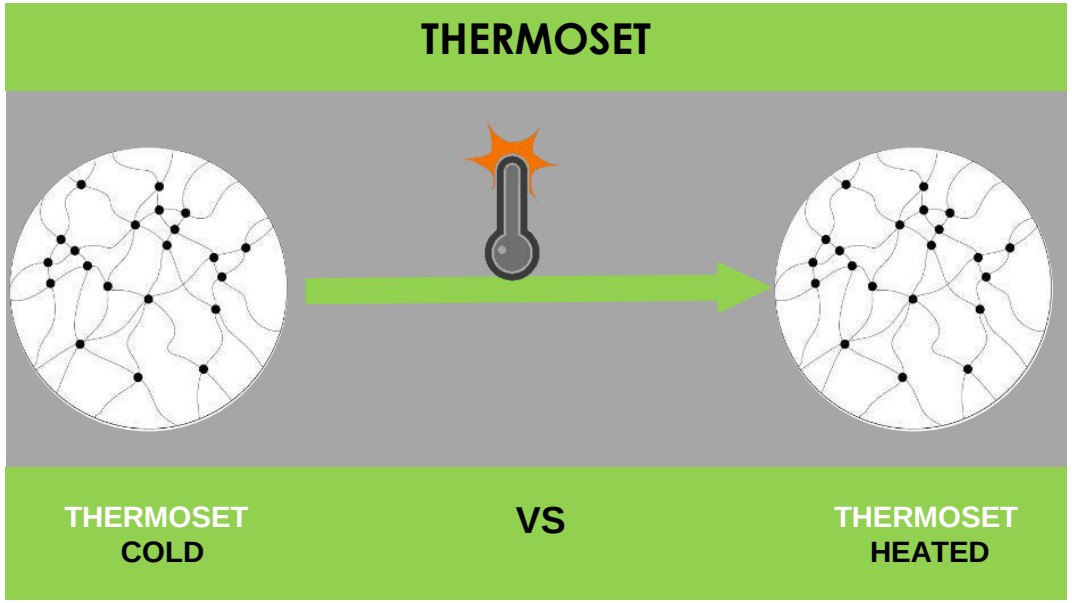
➢ **Electrical industry**

➢ **Aerospace**

TIGITAL 3D-Set Properties

Superior **Insulating Capability** over thermoplasts

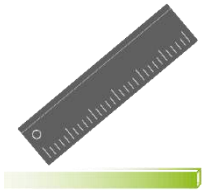
General Industry



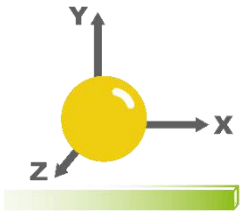
Electrical Industry

Thermoset are highly important in electronics industry, due to their excellent electrical insulation behavior and protecting electrical components from short circuiting, dust and moisture

TIGITAL 3D-Set Properties



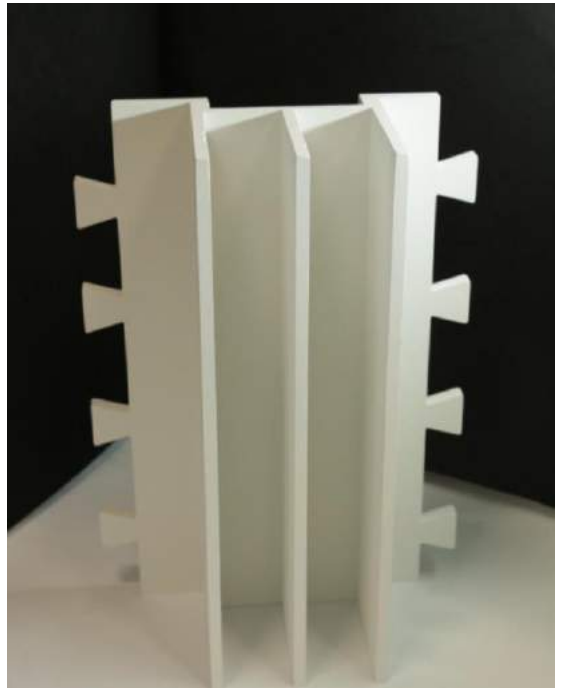
Need of higher **dimension stability**



Main advantages on Thermoset materials

- Isotropic behavior leeds to
- Stable mechanical properties in all print directions
- No or little curling and warpage
- Possibility to print larger flat and accurate partsa

Low shrinkage of <1% allows printing of large stable parts



Customization for your Needs!

Customization of Matrix Material

TIGITAL 3D Materials is offering customized Materials which are adjusted to the requirements of customers

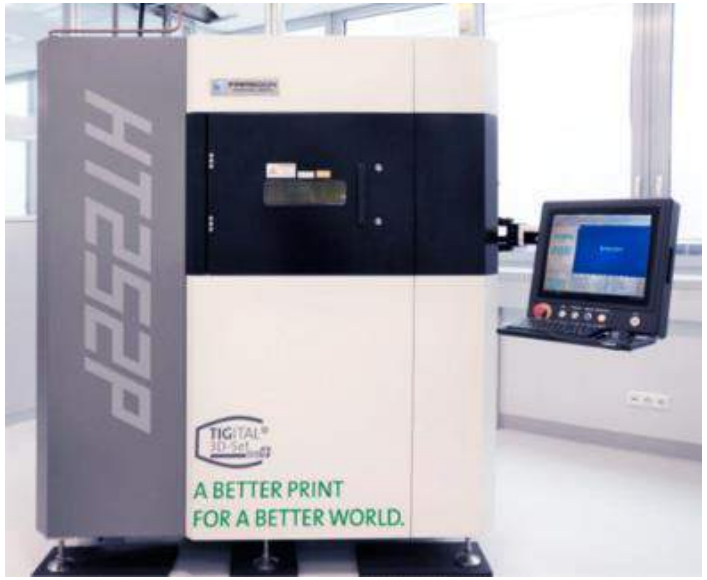
- Mechanical Properties
- Thermal properties
- Electrical Properties
- Chemical Properties




TIGITAL 3D-Set Properties

Fast **Production**
Low **Printing Temperatures**

TIGIUTAL 3D-Set Materials can be used in all
Open Platforms



- Printing Temperature of TIGITAL 3D Materials **<75°C**
- Printing Temperature of PA Based Materials **> 160°C**
- Cool down time of TIGITAL 3D Materials are extremely low compared to PA Materials

Druckparameter von TIGITAL 3D-Set

Fast **Production**
Low **Printing Temperatures**

- **Post-Process**
  - Due to the wide sintering window, caking does not occur even with temperature fluctuations
  - Parts can be un-packed easily

TIGITAL 3D-Set Product Mix

- **TIGITAL®** Series 370 **High** **P**erformance **P**olymers (HPP)
- High Tensile Modulus
- High Printing accuracy
- High dimensional control

E-Modul	2500 MPa
Strength	45 MPa
Elongation	2%
HDT Value	65°C

- **TIGITAL®** Series 371 **Top** **P**erformance **P**olymers (TPP).
- High Thermal resistance
- High mechanical Properties
- Weight saving, low density

E-Modul	2500 MPa
Strength	45 MPa
Elongation	2%
HDT Value	120°C

- **TIGITAL®** Series 371 **Premium** **P**erformance **P**olymers (PPP).
- Special properties like
- Outstanding Flame retardency

E-Modul	2500 MPa
Strength	40 MPa
Elongation	2%
HDT Value	100°C

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Questions?

Contact us:

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