

חידושים בהדפסה תלת ממדית תעשייתית טכנולוגיות הדפסה, חומרי גלם ועמידות בדרישות פיזיקליות/תקינה







שי אינברג

מנהל מחלקת מכירות תלת-מימד



Who we are

30 YEARS OF EXPERIENCE PROVIDING SOLUTIONS, NOT MACHINERY

TRUSTED BY THE LEADING BRAND













OUR DIVISIONS







3D PRINTERS

ROBOTICS & AUTOMATION **INJECTION MACHINES &** EQUIPMENT







PLASTIC WELDING

OUR RAPID MANUFACTURING SOLUTIONS











AGENDA:

Polyemers – multi material printing Polymers – engineering applications & Material portfolio. **Metal** DesktopMetal BMD - Studio System **Desktopmetal Binderjeting – Shop System** NanoDimension-AMEW





POLYMER





stratasys

The most widely used Polymer 3D printer in the world

Stratasys, an additive manufacturing pioneer who leeds the AM world wide industry. AN Israeli pride

Your paragraph text

Always innovating.

Always inventing.

Most widely-used 3D printer



*Represents Stratasys in Israel Since 1995



Stratasys



Ziv Sadeh

VP Sales and Marketing SU-PAD | Lecturer and specialist in plastic welding, cobots a... 1mo • 🕲

Thank you Laser Modeling Israel LTD for hosting me yesterday, together with new Stratasys CEO, Yoav Zeif, and EVP EMEA & APJ, Guy Yair.

...see more





*Represents Stratasys in Israel Since 1995



STRATSYS TECHNOLOGIES

FDM

- Thermoplastics
- Functional Prototypes, Tools and Final Parts

SLA

- UV Cured Resin
- Transperent/ hollow geometries
- part cost

POLYJET

- Photopolymers
- Material versatility including colors, different shores and clear materials on the same part/tray
- High resolution

COMING SOON: HSS, LPM, STEP









ADDITIVE MANUFACTURING POLYMERS



ADDITIVE MANUFACTURING FOR POLYMERS



Für alle Verfahren gilt: Durch den schichtweisen selektiven Ablauf entstehen dreidimensionale Strukturen. It applies to all processes: three-dimensional structures are created by the selective layer by-layer process.



PJ – Polyjet Technology





Polyiet Material Groups

GENERAL RIGID

- VERO FAMIL
- VIVID COLORS FAMILY
- RGD720
- RIGUR·DURUS

GENERAL **FLEXIBLE**

• TANGO FAMILY • AGILUS30 FAMILY

ENGINEERING MATERIALS

• DIGITAL ABS PLUS FAMILY

• HIGH TEMPERATURE

SPECIALTY/ DENTAL

- BIOCOMPATIBLE MED610
- DENTAL MATERIALS
- VEROGLAZEMED620
- VERODENTMED670
- VERODENTPLUSMED690
- VEROFLEXFAMILY
- HEARING AID MATERIALS

E* 7733 CS











Biocompatibility of MED610 as a Component in Gas Path Devices **Prepared For: Stratasys** 30 March, 2020



MULTI MATERIALES











REDUCING TIME TO MARKET



"..50 % Reduction in Lead Time."









stratasys Printed by J850

PANTONE VALIDATION



WORKFLOW PROCESS

3D PRINT DESIGN ITERATIONS FROM CONCEPT TO FINAL DESIGN





Stratasys[®] Printed by J850











CMF Design Challenges











DIGITAL ANATOMY PRINTING











לראשונה בהדסה: טכנולוגיה של הדפסת תלת ממד הצילה את היד של בת 13





לראשונה ביחידה לכירורגיה של היד בהדסה נותחו בני נוער עם שברים מורכבים באמות היד בטכנולוגיה הכוללת הדפסת דגם תלת מימד של האזור הפגוע. ד"ר שי לוריא: "על הדגמים הללו יכולנו לתכנן את מהלך הניתוח עד לרמת מילימטרים"

פורסם בתאריך: 14.6.20 15:22

מאת: מערכת "כל העיר"

















Areas where 3D printing use cases are expanding rapidly:

2017	27%	23%	14%
	Production Parts	Bridge Production	Repair and Maintenance
2019	52%	39%	38%

https://www.jabil.com/blog/future-of-3d-printing-additive-manufacturing-looks-bright.html











Materials / World of Plastics

Higher Cost. emperature. Strength

00

29

SMA PAMA PS

PVC SAN

Engineering

Standard Plastics

Highest thermal resistance & toughness

> Enhanced thermal resistance & toughness

> > Average thermal resistance & toughness





According to a survey of STATISTA from 2018 the scope of use of the materials is:

SLS PA 14.5%

statista 🗹

PLA I ABS 85.5%





FDM MATERIAL GROUPS

GENERAL

- ABSPLUS
- ABS-M30
- ABS-M301
- ABS-ESD7
- ABSI
- ASA
- PLA
- TPU

ENGINEERING -GRADE

- PC
- PC-ABS
- PC-ISO
- FDM NYLON 12
- FDM NYLON 6

HIGH PERFORMANC

SPECIALTY PRODUCTS

• ST-130

*ULTEM™ IS A REGISTERED TRADEMARK OF SABIC OR AFFILIATES.

• ULTEM™ 1010 RESIN -FOOD GRADE • ULTEM™ 9085 RESIN • PPSF / PPSU • FDM NYLON 12CF • ANTERO800NA (PEKK)



Fire Protection of Railway Vehicles EN-45545-2

ULTEM™ 9085 resin was printed with a T16A tip on the Stratasys F900 and tested per EN-45545-2. The testing establishes that this material meets requirements for:

- R1 HL1/2/3 at 25 mm thick in XY and XZ orientations and 5 mm in XZ orientation
- . R2 HL1/2/3 at 5 mm thick in XY orientation.

Table 9. ULTEM[™] 9085 Resin Fire Protection of Railway Vehicles Test Results

Test	Results	5mm XY	5mm XZ	25mm XY	25m
	Ds(4)	×.	(a)	38	57
ISO 5659-2	VOF4	()#)	2. 4 0	62	94
	Dm	(e)	22	228	231
	ITC 4 minutes	~	121	0.02	0.01
ISO 5659-2 + EN 45545-2 Appendix C	ITC 8 minutes			0.08	0.06
ISO 5660-1	MAHRE (kW/m2)		171	24.1	19.9
ISO 5658-2	CFE (kW/m2)	16.5	12.5	29.9	28.6

Outgassing

ULTEM™ 9085 resin, natural and black, was printed with a T20 and T16 tip on the Stratasys F900 and tested per ASTM E595. Full report available upon request.

Table 8. ULTEM™ 9085 Resin Outgassing	Test Results		
Sample	TML (%)	CVCM (%)	WVR (%)
ULTEM [™] 9085 Resin, Natural, T20 Tip	0.34	0.02	0.35
ULTEM [™] 9085 Resin, Natural, T16A Tip	0.37	<0.01	0.38
ULTEM [™] 9085 Resin, Black, T16 Tip	0.33	< 0.01	0.22
Testing Observations ⁽¹⁾			
Visible Condensate No		Opaque	N/A
Percent Covered 0%		Interference Fringes	N/A
Thin N/A		Colored Fringes	N/A
Heavy N/A		Sample appearance after test	No change
Transparent N/A			

(1) Observations apply to all tested samples

• ST-130





CERTIFIED AND VALIDATED MATERIAL

Certified ULTEM 9085 Resin



LETEM** 0085 ment is a flame-returbant high-performance thermoplastic for digital manufacturing and rapid prototyping. It is taken by the transportation industry due to its high strength to weight into and its FST (flame, amoke and toxicity) rating. This unique indexials certifications make it an excellent choice for the commercial transportation industry – specifically aerospece, marine and ground vehicles. Combined with a Fortus* 3D Pinter, ULTEM 0085 rean allows design and manufacturing engineers to produce fully functional parts that are ideal for advanced functional prototypes or and use without the cost or lead time of traditional toping. Strategys Certified ULTEM 9085 men meets the extensive, more attrapent test criters and retars motival tracestally required by the servicepole industries and regulatory agencies.

- A Certificate of Analysis for both raw material and Nament are supplied, documenting test results and identification to match teament manufacturing for number to raw material bandy number. This allows thosebility from protect part book to raw material.
- A Certificate of Contormance conterns that the material is menufactured in compliance to approved Similarys and Industry specifications

Mechanical Properties	Test Method	XY Orientation	XZ Orientation	ZX Orientation	ZX-45 Orientation
	ASTM D638	87 MPa	77 MPa	59 MFa	55 MPa
sensia Sineigh, Ultrata (ijes 1, 0.1007)		(0,700pul)	(11.200 pill	(8,500 µul)	(8,000 pai)
	1 ASTM D638	DB MPs	45 MPa	35 MPb	117 MPB
Ionale Stanger, 0.2% offset yold nype 1, 0,136-1		(5.500 pm)	(8,500 pa)	(5.500 pai)	(5,400 pai)
		2.02 GFB	2.6 GPa	2.4 GPn	2.35 0Pm
Tenpie Modului (Type 1, U.1301)	ASTM D638	(2017 km)	(3177 kel)	(3)(27 km)	(347.88)
Rensie Elongetion at Rensik (Spec 1, 0.1007)	ASTM DOD	7.00%	6.21%	3.63%	3.10%
	a resta a franci	116 MPs	130 MPo	83 MFn	84 MPp
resulte offenget	ASTM D/M	(16,700 pis)	(18,900 pre)	(12,100 pa)	(12,200 (re)
Construction of the second second	ADDRESS INCOME.	85 MPa	G6 MPa	79 MPa	75 NPu
anna cas du crue casa	HOLE OF BUILDING	(12,300pu)	(14.200µiii)	(11,400 ps)	(10,900 pai
Designer Merchalus	ARTIA DOOD	2.4 GPa	2.0.0Pa	2.3 0Ps	2.2 GP#
What is not wait is	ALCO DO DO	(254-kis)	(380.5 ka)	[328.5 kg]	(214 km)
Commencies Operants Weld months of them 4.7.0	ASTM D605	54 NF/8	75 MPb	57 MFn	16.5 MPB
Compressive Serength were imposited type (1.1.2)		(7,800 pa)	(HU, HOD piel)	(5.000 peti	(8,200 ps)
	A PROVIDE THE PARTY	2.7 GPa	3.1 GPH	2.8 OPa	2.85 0.94
Compressive Modulus (modified type 6.7.2)	ASTM Devis	(394 kia)	(A48 kai)	(403 kai)	(384 kul)
	ASTM D6379	50 MPa			
Shiar Sherigh (V-noich In-Plane Shear)		(7,200 pm)			
2472-24727-34	ASTM D6375	0.9 GPa			
Shiar Modulai		(131 km)			
OLT Strength	ARTIS DOTAS	45 MP3	.61 MPa	29 MPm	-34.5 MF/t
uni szangi)	A31WLD0100	(B.560 p6)	(8,900 ps)	(4.200 peri	(5,000 pts)
AUT MINIBLE	ASIM D5706	1.05 OPa	2.4-0Pa	2.1 OPa	2.1. OPa
or it an other than		(205 km)	(343 kul)	(310 kal)	[300 km]
Duit Dissouth	ADDES PRIVAT	0.2 MP/n	09 MPh	SD MFW	46 MPn
in analysi	Provinti Dan AL	(7,500 pm)	(10,000 ptl)	(7,000 (19)	(5,700 pm)
HT MOLAN	ASTN: DEZ/A	2.4 GPa	2.83 GPp	2.6 GPn	2.4 GPu
an weisen	2022/07/22/22/22	(343 ks)	(411 km)	p370 kml	(DEJ km)
HC Strength	AREM DR742	45 MPa	72 MPu	63 MPa	48 MPu
and the second of the second sec	C 100 0 101 80800 (100)	(8,500 pe)	(10,400 pali	(9,100 pa)	(7,000 ps)
HE Mothing	ASTM DETAIL	2.4 GPa	2.8 GPa	2.55 GPa	2.6 GPu
225.020202	Contract Ender High	(346 kpl)	(400 kol)	(370 kul)	(373 kol)
Situdo Shour Rossitur	ASTM DS951	204 MP#	196 MP8	189 MP/1	150 MPa
and the second sec	Contact Belows ((29,600 pm)	(28),450 and	127.350 pail	(22.850 per

Plastics for Additive Manufacturing Guide Information

Process Cate

STRATASYS INC

7665 Commerce Way, Eden Prairie MN 55344-2001

ULTEM™ 9085 Resin, ULTEM™ 9085 Resin CO

Polyethenimide (PEI), furnished as filaments

	Min. Thk	Flame
Color	(<u>mm</u>)	Class
NC	0.508	V-0
	3.0	V-0

Comparative Tracking Index (CTI): -

- Dielectric Strength (kV/mm): -
- High-Voltage Arc Tracking Rate (HVTR): -
- IEC Comparative Tracking Index (Volts Max): -
 - IEC Ball Pressure (°C): -
 - ISO Tensile Strength (MPa) -
 - ISO Tensile Impact (kJ/m²): -

Process Category: Material Extrusion

Build Plane: Horizont Layer Thickness (mm): 0.254(T Infill (%): -Post Processing Method: Mechan For use with printer: FORTUS Limited properties and ratings assigned to samples produced by the Other print parameters and IEC/ISO small-scale test data does not pertain to building materials, furnishin materials used in the components and parts of end-proc

Report Date: 2019-07-11

egory: Material Extrusion			×.	/iew Blue Car	E345258	
G						
HWI	HAI	GWII	GWEI	RTI Elec	RII Imp	RTI
-	2			105	105	105
	ISO	ISO Chan Heat Deflection ISO Flexur ISO Izo	py Impact (kJ/m @1.80 MPa (* al Strength (MP od Impact (kJ/m	1 ²): - C): - 'a): - 1 ²): -		
		Printing	Process Desig	nation Numb	er 1 •	
tal 16)		Raste	r Angle (Degree t Speed (mm/se	es): 90 ec): -		
ical Brea S™ 400 Additive N d build str	akage of Su , FORTUS* tanufacturing ategies may to	pport Material 380, FORTUS technique represen esult in significantly	ting a specific set of different results	JS™ 900mc, of printing param	Stratasys before and bu	F900 [™] ild strategy.
igs and rela duct device	sted contents. IE s and appliance	CASO small-scale let s, where the acceptal	st data is intended so bility of the combination	ely for determinin an is determined t	g the Barnmab by UL.	lity of plastic





STRATASYS STRATEGIC INITIATIVES FOR AEROSPACE

- Simplify the path to part certification, a must for additively manufactured parts for certified aircraft
- Establish collaborative partnerships to develop materials, systems and processes for aerospace

actured parts for certified aircraft and processes for aerospace








First 3D printed parts on British passenger trains



94% lead time **50%** cost

LEUCHTENTRÄGER AUS ULTEM9085[™] RESIN ANSTATT ALUGRUCI



External Duct in ULTEM 9085

BOMBARDIEK

SHEET METAL FORMING

CYCLE TEST

400 cycles with no signs of wear 7075-0 Aluminum 0.090in (2.29mm)

SHEET THICKNESSES

ü0.016in to 0.100in (0.41mm to 2.54mm)







METALS FORMED

üAluminum alloys üSteels üStainless steels

üTitanium ülnconel

PRINTING SPARE PART

PRINTER:

MATERIAL

Fortus900

ULTEM9085





SIEMENS

ULTEM 1010

3D Print with the Strongest FDM Material.

ULTEM™ 1010 resin offers superior tensile strength and excellent chemical and thermal resistance for an FDM thermoplastic. Available in general-purpose and certified grades, ULTEMTM 1010 resin uses breakaway support. Certified grade is biocompatible and approved for food contact with NSF 51 and ISO 10993/USP Class VI certifications.

BEHAVIOR AND USE







IZOD IMPACT, NOTCHED

41 J/m (XZ Axis) and 24 J/m (ZX Axis)



"

Not only do we enjoy a cost saving, but thanks to the ability to 3D print a customized part on-demand, there is no minimum order requirement. On certain orders we are witnessing cost savings of up to 55%."

Alex Karetny Pack Line Ltd.









2 Wissenschaftsstadt

Periprosthetic infection is a common problem that many surgeons are facing but lacking standard solutions for reconstructing the bone defect created after remova of the infected implant.

Last week, a 52 Y male with a periprosthetic deep infection of a humeral implant following osteosarcoma resection of the distal humerus and elbow. This 3D printed mold helps to achieve the accurate design and volume of an existing implant and replace it with a spacer. Otherwise, it would be done freehand The challenge here was to produce a hinged spacer to preserve elbow movement during the antibiotic treatment period. The mold design enabled the surgeons to execute some innovative articulating solutions that cannot be done otherwise. This case operated by Dr. **Solomon Dadia** and Dr. Omri Merose, after planning and design sessions with the designer **Tal Wainer Katsir** from **Synergy3DMed**.









2 Wissenschaftsstadt

ANTERO PEKK





High-performance PEKK-based material

Antero 800NA PEKK-based thermoplastic possesses excellent mechanical properties that include high strength, high heat resistance, toughness and wear-resistance. These superior gualities make it a lighter alternative to aluminum and steel. Chemical resistance and minimal outgassing provide suitability for aerospace applications.

BEHAVIOR AND USE





Table 6. Antoro 800NA Chemical Resistance Results

	Reagent	Non-Annealed XZ	Non-Annealed ZX	Annealed XZ	Annealed ZX
fensile Strength	Dichloromethane	-86%	-81%	-15%	1%
	Ethyl Acetate	-20%	-4%	-19%	-7%
	Jet A.	-14%	-3%	11%	-1%
	Methyl Ethyl Ketone	-17%	-7%	-16%	-7%
	Skydrol	-5%	16%	10%	-9%
	Toluene	-17%	-1196	-14%	-9%
	30% Ntric Acid	-8%	-0%	-7%	7%
	30% Sutturic Acid	2%	0%	-4%	1%
	60% NaOH	200%	-5%	7%	1%
	Concentrated Ammonia	2%	-4%	2%	4%
6 Eorgation @ Break	Dichloromethane	1135%	2264%	-11%	0%
	Ethyl Acetate	9%	-196	3%	-5%
	Jet A	25%	-136	45%	2%
	Methyl Ethyl Ketone	21%	-2%	16%	-2%
	Skydrol	24%	26%	48%	-7%
	Toluene	8%	-7%	12%	+7%
	30% Ntric Acid	-10%	8%	-12%	7%
	30% Sulfurio Acid	4%	-3%	-4%	4%
	60% NaOH	9%	-10%	8%	3%
	Concentrated Ammonia	10%	-9%	12%	11%
fensle Modulus	Dichloromethane	-92%	-00%	-1%	-1%
	Ethyl Acetate	-3%	-4%	-3%	-1%
	Jet A	-3%	-3%	-4%	-3%
	Methyl Ethyl Ketone	-2%	-0%	-4%	-4%
	Skydral	-3%	-4%	-1%	-4%
	Toluene	-196	45	-3%	-3%
	30% Notic Acid	0%	-0%	-2%	2%
	30% Sulturic Acid	2%	0%	2%	-2%
	60% NaOH	-1%	7%	3%	0%
	Concentrated Ammonia		10%	0%	-8%



Electrically Static Dissipative (ESD) PEKK

Sensitive electronics applications requiring ESD properties

<u>Uissensch</u>

- Electrical resistivity <10⁹ ohm
- Inherent flame resistance and high temperature capabilities







Wissenschaftsstadt



Ultimate Tensile Strength

Antero 840CN03: 95 (13610) ULTEM™ 9085 resin: 69 (9950) Nylon 6: 68 (9800) PC: 57 (8300)

MPa (PSI)

-

ESD Safe









-

_

-

Wissenschaftsstadt

DOCUMENT NAME	FILE TYPE
Antero 840CN03 data sheet	PDF
Antero 840CN03 safety sheet	PDF
Antero 840CN03 material guide	PDF
Chemical Resistance of Antero 840CN03	PDF
Electrical Properties of Antero 840CN03	PDF
Materials Testing Procedure	PDF





Nylon12 CF

2 Wissenschaftsstadt

Lightweight Strength, Carbon Fiber Reinforced

The combination of high strength, stiffness and light weight lets you use FDM Nylon 12CF to replace metal components, for lighter tools, functional prototyping and select end-use parts. BEHAVIOR AND USE



TENSILE STRENGTH

63.4 MPa (XZ Axis) 28.9 MPa (ZX Axis)



TENSILE MODULUS

7515 MPa (XZ Axis) 2300 MPa (ZX Axis)



HDT @ 264 PSI 143 °C





IZOD IMPACT, NOTCHED

85 J/m (XZ Axis) 21.4 J/m (ZX Axis)



End of Arm

- Weight savings: 45 kg (61.25%)
- Cycle time savings: 19.3%

Los

Cost savings: . \$1,642 (29.8%)

\$







.

CNC Tooling & Fixtures

- 3 to 7 times lighter with Nylon12CF than aluminum or steel
- Over 900 bars compressive strength
- Cost saving 50 to 60%
 - Fixtures printed in hours not days







GKN Driveline – Greasing Tool

2 Wissenschaftsstadt



production

Challenge

This often lead to spills, requiring time to clean up



Application

Greasing of a half shaft during

Previously implemented as a bendable tube, where a high volume of oil was forced out a singular point of exit





AM optimized redesign



2 Wissenschaftsstadt

No support material generated for internal structures in optimized segments (even if green flagged)

Tube connector utilizes traditional design for demonstrative purposes, could also be redesigned

Lean tool that requires less material and time to be produced (in any case)





2 Wissenschaftsstadt

What about mechanical properties?









2 Wissenschaftsstadt

TPU

LEADING USE CASES







F123 TPU 92A Making the complex easy...with Stratasys soluble support













standard engineering portfolio







2 Wissenschaftsstadt

USAGE DYNAMICS





REDUCTION OF LEAD TIME AND COST



Printer: Fortus 450MC – STRATASYS **Material:** ASA



Printer: Fortus 450MC STRATASYS **Material:** ABS M30i





Printer: Fortus 450MC STRATASYS **Material:** Nylon12 CF





Printer: Fortus 450MC – STRATASYS Material: Antero800NA



Printer: Fortus 450MC – STRATASYS Material: ULTEM9085



Printer: Fortus 450MC – STRATASYS Material: ASA



Printer: Fortus 450MC – STRATASYS Material: 1.ULTEM 9085 .2 ABS 3.Nylc







stratasys F**120**

Finally. Affordable industrial-grade 3D printing.



ADDITIVE MANUFACTURING FOR METAL





Desktop Metal

Desktop Metal is reinventing the way engineering and manufacturing teams produce metal parts - from prototyping through mass production.

>\$500M investment to bring metal AM into mass market

+180 engineers / 15 PhDs (including 4 MIT professors)

+200 patents in process







DesktopMetal Studio system

Today's metal 3D printers are like 1970s punchcard computers



Centralized facilities, raised floors, punchcards, mag tapes, very expensive



Explosion proof room, large outdoor argon gas tanks, 480V 3 phase, respirators, specialized operators, \$600k printer + \$200k post processing equip. + \$200k facility





The world's first office-friendly metal 3D printing system





MIM VS. STUDIO SYSTEM PROCESS



 \bigcirc

1. Prep

2. Print



3. Debind







SINTER



4. Sinter











Green parts are composed of powders fully bound in a polymer





Sintered parts are comosed of dense, polymer-free metal



Wide range of materials

- Designed around the Metal Injection Molding (MIM) powder supply chain
- Over 30 alloys under development
- Seven alloys available

CORE ALLOYS

- 17-4 PH STAINLESS
- 316L STAINLESS
- H13 TOOL STEEL
- 4140 CHROME MOLY
- COPPER INCONEL 625
- SUPERALLOY






Material Properties meet or exceed material standards from ASTM/MPIF



	Studio System	Studio System	
	oradio oyatem	otadio oystem	
standard	as-sintered	heat treated ³	
ASTM E82	650	1250	
ASTM E82	1325	1720	
ASTM E8 ²	2.3%	5.8%	
ASTM E18	35	45	







17-4 PH Stainless Steel



316L Stainless Steel



H13 Tool Steel



4140 Low Alloy Steel



Alloy 625 Nickel Based Superalloy



Copper High Purity Copper









האוניברסיטה העברית בירושלים THE HEBREW UNIVERSITY OF JERUSALEM

3D and Functional Printing Center The Center for Nanoscience and Nanotechnology

המרכז להדפסה תלת מימדית ופונקציונלית המרכז לננומדע וננוטכנולוגיה





Shop and Production System

Affordable, turnkey solution

The Shop System contains all pieces of equipment your machine shop needs to begin binder jetting — from print through sintering. And with a range of build volume configurations (4L, 8L, 12L, and 16L), the Shop System is designed to scale to your shop's throughput.

- End-to-end system (print through sinter)
- Range of models: 4L, 8L, 12L,16L build boxes
- Printer starting at \$150,000; turnkey solutions starting at just over \$300,000



PRODUCTIVITY

- → Fast
- → Effortless
- → Flexible

QUALITY

- → High resolution parts
- → Fine feature detail
- \rightarrow 5x redundancy



COST & THROUGHPUT COMPARISON PART EXAMPLE #1

Output pulley

- Part volume: 3,627 mm3 (0.22 in3)
- Dimensions: 41 x 26 x 8 mm (1.6 x 1.0 x 0.3 in)
- Time to market via binder jetting significantly faster than traditional manufacturing
- Traditional manufacturing tooling requires side actions / sliders - impact to part cost

	Studio System	Shop System - 8L	Production System
Parts / year	3,120	144,199	3,423,420
Cost / part	\$33.80	\$6.75	\$0.79
Cost / cc	\$6.54	\$1.86	\$0.22



























Introduction to Metal Powder Bed Fusion and Xact Metal

POWDER BED FUSION 3D PRINTING IS HERE.

FEATURE CAPABILITIES OF XACT METAL PRINTERS

- Fast enough for most applications
- User friendly intuitive modern graphical user interface (GUI)
- Fast change-over between builds
- Open powder and open architecture
- Recognized build software and powder metal suppliers

ALL FOR \$90,000



METAL POWDER BED FUSION CAPABILITIES

Typical Metals:

Must Have Good Weldability

- Stainless Steels: 316L, 17-4 PH, 15-5 & 400 series
- Super Alloys: 625, 718, Cobalt Chrome F75, and other Nickel, Chromium & Molybdenum based alloys
- Tooling Steels: Maraging M300
- Bronze and Copper
- Precious Metals (Gold and Silver)
- Aluminum AlSi10Mg and Titanium Ti-64

Mechanical Properties

Tensile value, elongation, modulus of elasticity, and hardness properties comparable to as-forged or cast properties.

Build Tolerance

- 0.0024 in.)

*Tolerances of 20 to 50 microns (0.001 to 0.002 in.) achievable after process optimization for a given geometry.

Minimum Dimensions

- microns (0.004 in.)
- . (0.008 in.)



• Part Dimensions <30 mm (1.18 in.): +/- 60 microns (+/-

• Part Dimensions >30 mm (1.18 in.): +/-0.2%

• Minimum practical wall thickness: 100 • Minimum practical hole size: 200 microns

TYPICAL BENCHMARKS





NANODIMENSION

Electrifying Additive Manufacturing®





NANODIMENSION Electrifying Additive Manufacturing®

Nano Dimension is the world's leading additive electronics provider, targeting the growing demand for sophisticated electronic devices that rely on sensors, antennas, PCBs, capacitors and IC packaging

Our additive manufacturing solutions are mission



critical and economical for our customers

KEY TECHNOLOGIES

- Multi-layer Rigid PCB
- Side contacts
- Vertically integrated ICs
- **Printed Capacitors** •
- RF: Antennas up to 6Ghz, Transmission line up to 20Ghz
- **Battery Socket**
- **BGA/SMT** mounting
- Inductor: Coils
- Sensors: torque, touch, strain gauge
- Transformers: AC2AC, AC2DC, DC2DC





2 printheads inkjet both materials simultaneously: Both conductor & substrate are printed 100% fully additive process!





ממשיכים להוביל את שוק הראפיד תוך הקניית יתרון יחסי ללקוחותינו









StrataSys

