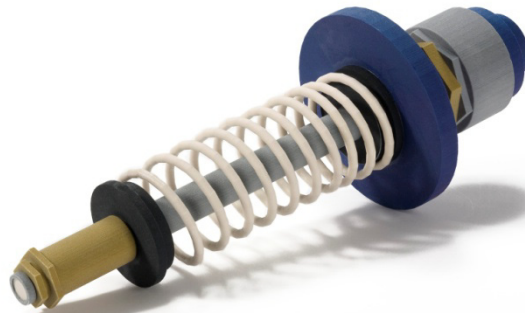




Z CORPORATION®

3DP™ Consumables Catalog



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1 Introduction

Z Corporation® offers several material systems to satisfy a variety of modeling needs. This guide is designed to give users an overview of the different types of powders, binder and infiltrants that can be used with 3D printers. The part numbers associated with each product are also listed.

These material choices allow you to tailor the properties of the finished models by selecting different infiltrants based on the application.

No matter which material you choose, you will always get the fast, high quality, and low material cost printing our machines are known for.



ZPrinter® 310 Plus
Monochrome, affordable, easy to use.



ZPrinter® 350
Monochrome, automated, office-friendly.



ZPrinter® 450
Full color, automated, office-friendly.



ZPrinter® 650
Fastest print speed, largest color models and highest throughput.



1.1 Printers and Materials Compatibility




	High Performance Composite	Direct Metal Casting	Investment Casting	Elastomeric
	zp [®] 150	ZCast [®]	zp 14	zp 15e
Printers				
ZPrinter [®] 310 Plus	zb [®] 60	zb 56	zb 51	zb 51
ZPrinter 350	zb 63	-	-	-
ZPrinter 450	zb 63	-	-	-
ZPrinter 650	zb 61	-	-	-
Infiltrants				
Z-Bond [™] 101/ Z-Bond 90	✓	-	-	-
Z-Max [™] Epoxy	✓	-	-	-
Wax	✓	-	✓	-
Z-Bond 11	-	-	✓	-
Elastomer Kit	-	-	-	✓
Salt Water	✓	-	-	-

Note – For printers and materials not listed here, visit the Legacy Printers and Materials section of our Web site at zcentral.zcorp.com.

1.2 Available Sizes

Z Corporation powders and their compatible binders are available in a variety of sizes and packaging.

Powders			
Package	Printed Parts Volume (Approx.)	Appearance	Notes
Mini-Pail	325 in ³ 5326 cm ³		
Cartridge	400 in ³ 6555 cm ³		Compatible with automatic powder loading (Automated 3D Printers)
Pail	500 in ³ 8194 cm ³		
Eco-Drum	700 in ³ 11471 cm ³		Made from renewable resources and 100% recyclable
Drum	2000 in ³ 32774 cm ³		

Binders		
Package	Fluid Volume	Appearance
Cartridge (small)	10 oz./ .3 L	
Cartridge (large)	34 oz./ 1.0 L	
Bottle (small)	.5 gal./1.9 L	
Bottle (large)	1 gal./3.8 L	

2 High Performance Composite Materials

The foundation of 3DP™ technology is the High Performance Composite Material. It consists of a highly engineered powder with numerous additives that maximize surface finish, feature resolution, and part strength. Each material, paired with its corresponding binder, produces high-definition parts that are fit for the most demanding 3D printing application.

2.1 zp® 150

The zp 150 series includes zp150 powder as well as zb® 60, zb 61 and zb 63 binders.

zp150 is a High Performance Plus material for making strong, high-definition parts. It features the highest green strength right out of the printer, improved final strength and because the material is so white, 3D models printed with zp150 feature vivid color.

Additionally, zp150 features a new Water Cure finishing option. Simply spray your 3D-printed model with a fine mist of water mixed with salt, dry it, and it's ready to be shown and touched.

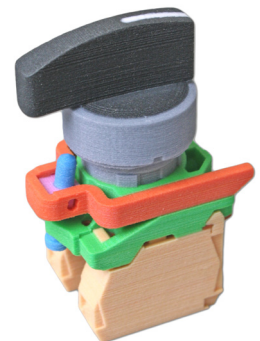
zp150's performance improvements and the new Water Cure option truly expand the possibilities of your 3D printer. Use Water Cure for early concept iterations and ergonomics tests, and then finish your new designs with Z-Max™ for functional testing.

zp 150 Features

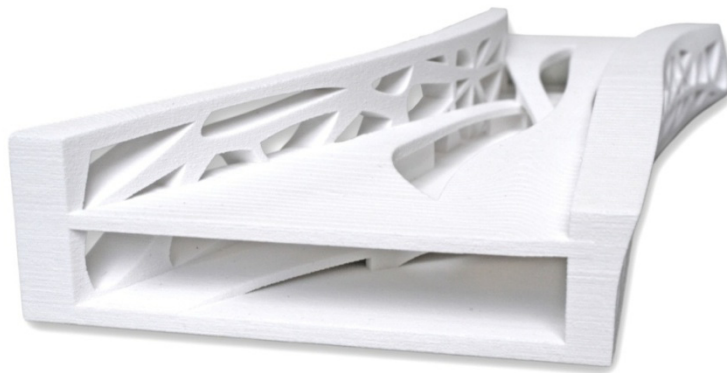
- Water cure finishing for both monochrome and color models
- Highest green strength and final strength
- Extremely bright white

Compatibility Check – zp 150

- ZPrinter 350 + zb 63
- ZPrinter 450 + zb 63
- ZPrinter 650 + zb 61
- ZPrinter 310 / 310 Plus + zb 60



zp 150 product family			
Material	Description	Unit of Measure	Part #
Powder	zp 150 (Cartridge)	17.6 lbs (8 kg)	50407
	zp 150 (Eco-Drum)	30.8 lbs (14 kg)	50367
	zp 150 (Mini-pail)	14.3 lbs (6.5 kg)	50440
Binder	zb 60 Clear (Bottle)	1 gal. (3.8 L)	06932
	zb 60 Cyan (Bottle)	.5 gal (1.9 L)	06933
	zb 60 Magenta (Bottle)	.5 gal (1.9 L)	06934
	zb 60 Yellow (Bottle)	.5 gal (1.9 L)	06935
	zb 61 Clear (Cartridge)	34 oz./1 L	Z0170 (pkg. 2)
	zb 61 Black (Cartridge)	34 oz./1 L	Z0171 (pkg. 2)
	zb 61 Cyan (Cartridge)	10 oz./3 L	Z0172 (pkg. 2)
	zb 61 Magenta (Cartridge)	10 oz./3 L	Z0173 (pkg. 2)
	zb 61 Yellow (Cartridge)	10 oz./3 L	Z0174 (pkg. 2)
	zb 63 Clear (Cartridge)	34 oz./1 L	Z0177 (pkg. 2)



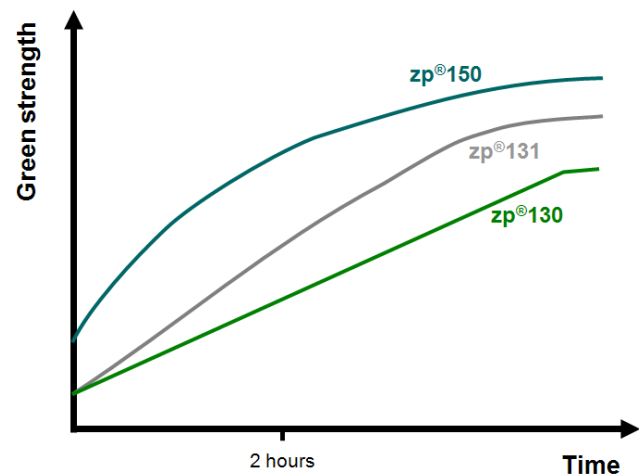
2.2 Legacy High Performance Composites

Through the years and several generations of new materials, Z Corporation has developed and improved its line of High Performance Composites. By focusing on improving both ease of use and performance, each new material has enabled broader use of 3D printing.

Legacy High performance Composite materials include zp140, zp131, zp130, zp102 and zp100.

Key improvements of zp150 over legacy materials include:

- **Model strength**
 - Higher green strength*
 - Higher final strength, achieved by increasing compatibility with Z-Bond
- **Resolution**
 - Smaller features can be printed
- **Model color and whiteness**
 - More unique colors can be printed
 - Higher color fidelity
 - Better whiteness
- **Ease of use & office compatibility**
 - Models dry faster
 - Lower dust
 - New no-chemical Water Cure finishing**



* Strength of models when taken out of the printer, before infiltration

** With Epsom salt

3 Metal Casting Materials

If you need to work with metal casting, Z Corporation® has two options for you: direct metal casting with ZCast® or investment casting with zp® 14. Either way you get your cast parts quickly, with the accuracy of 3D printing directly from the CAD file.

3.1 ZCast 501

Direct Metal Casting

The ZCast 501 Direct Metal Casting process provides the ability to produce cast metal parts from a CAD file significantly faster and less expensively than traditional prototype casting methods. Printing molds and cores directly from digital data eliminates the pattern and core box production step used in traditional sand-casting processes. Metal is poured directly into the 3D printed molds. The technology allows engineers to prototype parts in metal that are costly and time consuming to produce using traditional methods.

Direct Casting Material can be used to create sand casting molds for non-ferrous metals. This material is a blend of foundry sand, plaster, and other additives that have been combined to provide strong molds with good surface finish. It is designed to withstand the heat required to cast non-ferrous metals.

After removal from the printer, printed molds must be baked in an oven at 375°F for 4-8 hours to remove excess moisture from the mold before metal is poured. ZCast 501 molds should never be infiltrated. Common foundry products such as core paste and refractory mold wash can be used to prepare the mold for pour as they have been designed to withstand the temperatures of the casting process. Refer to the ZCast Design Guide for more details on this process.

Compatibility Check – ZCast

- ZPrinter 310 Plus + zb 56

The ZCast Process

- Extremely fast turnaround from CAD file to prototype metal part
- Easily print complex molds and cores
- In-house mold-making capabilities for product manufacturers
- Simple metal-pouring process for foundries



Direct metal casting materials

Material	Description	Unit of Measure	Part #
Powder	ZCast 501 (pail)	33 lbs. (15 kg)	06439
	ZCast 501 (drum)	132 lbs. (60 kg)	06438
Binder	zb 56 clear (jug)	1 gal. (3.8 l)	06312

3.2 zp[®] 14

Investment Casting

zp 14 Investment Casting Material can be used to quickly fabricate parts that can be dipped in wax to produce investment casting patterns. The material consists of a mix of cellulose, specialty fibers, and other additives that combine to provide an accurate part while maximizing the absorption of wax and minimizing residue during the burnout process.

Investment casting using zp 14 involves printing a male pattern, which is then infiltrated with wax and/or Z-Bond™ 11. Once infiltrated, the pattern is coated with an investment slurry, creating a mold. A cycle in the oven will burn out the printed pattern.

Investment casting materials			
Material	Description	Unit of Measure	Part #
Powder	zp [®] 14 (pail)	11 lbs. (5 kg)	06127
	zp 14 (drum)	44 lbs. (20 kg)	06128
Binder	zb [®] 51	1 gal. (3.8 l)	05892
Infiltrant	Z-Bond 11	7.76 oz. (220 g)	15079
	Paraplast X-TRA™	17.6 lbs. (8 kg)	10434

Compatibility Check – zp 14

- ZPrinter 310 Plus + zb 51

Tech Tip

Investment casting: Work with your local investment casting foundry to find the proper shrinkage factor for the metal alloy used for the pour.



4 Elastomeric Materials

4.1 zp 15e

Elastomeric material has been optimized for infiltration with an elastomer to create parts with rubber-like properties. The material consists of a mix of cellulose, specialty fibers, and other additives that combine to provide an accurate part capable of absorbing the elastomer, which gives the parts their rubber-like properties.

Elastomeric Materials			
Category	Description	Unit of Measure	Part #
Powder	zp 15e pail	9.9 lbs. (4.5 kg)	06129
Binder	zb 51 clear	1 gal. (3.8 L)	05892
	zb 58 clear	1 gal. (3.8 L)	06660
	zb 58 cyan	.5 gal. (1.9 L)	06661
	zb 58 magenta	.5 gal. (1.9 L)	06662
	zb 58 yellow	.5 gal. (1.9 L)	06663

Compatibility Check – zp 15e

- ZPrinter 310 Plus + zb 51



5 Infiltration

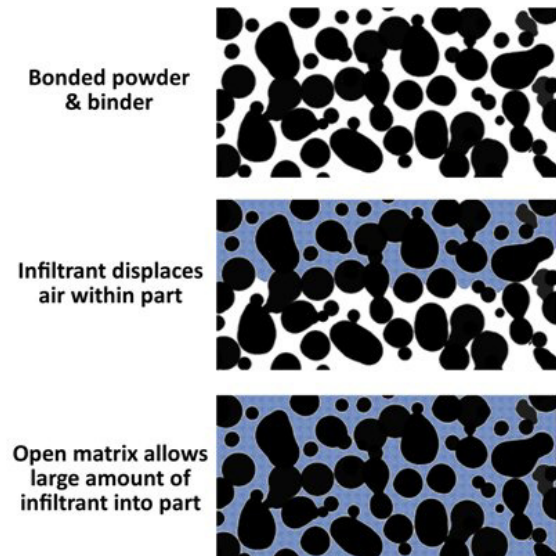
Infiltration is the process of applying a liquid resin to a printed part to provide strength and impart specific properties. Our infiltration systems have been selected for their ability to fill porosities, for the exceptional mechanical and thermal properties they confer models and for their ease of use.

5.1 How It Works

The first diagram illustrates the open matrix of green (just-printed) parts. The powder particles are bonded to each other by the binder.

In the second drawing, infiltrant (shown in blue) has been applied to the surface of the matrix, and is starting to penetrate, displacing air from the interior of the matrix.

Finally, the third diagram shows how the infiltrant is drawn into the part, sealing the surface area and improving the appearance and strength of the part.



5.2 Mechanical Properties

The mechanical properties of the finished, infiltrated part depend mostly on the infiltration method chosen. The table below lists typical results using standard ASTM test methods.

Mechanical Properties				
Properties	ASTM Procedure	Water Cure	Z-Bond 101	Z-Max
Tensile Strength, MPa	D-636	-	14.2	26.4
Elongation at Break, %	D-636	-	0.23	0.21
Modulus of Elasticity, MPa	D-636	-	9,450	12,560
Flexural Strength, MPa	D-790	13.1	31.1	44.1
Flexural Modulus, MPa	D-790	6,355	7,163	10,680

Note: zp 150 powder used for all tests.

Infiltration Products

Z Corporation offers three families of infiltrants, with properties specifically optimized for different applications:

- Concept modeling
- Functional modeling
- Specialty infiltrants

The Guide below summarizes the performance of each of the infiltrants. More details about each family are provided in the sections that follow.

infiltrant guide								
Product	Description	Application Method	Infiltrant Color/ Part Color	Mix Ratio	Penetration Depth (mm)	Working time	Cure Time @ 70°F/ 21°C	Cure Time @ 160°F/ 71°C
Concept Infiltrants								
Z-Bond™ 101 Premium	Instant Cure	Dip Drizzle	Clear/ Color	-	0.5-3	-	5-10 min	-
Z-Bond 90 Economy	Instant Cure	Dip Drizzle	Clear/ Color	-	0.5-3	-	15-30 min	-
Paraplast X-TRA™ Wax	Seal & protect Low strength	Dip ZW4	Clear/ Color	-	Up to 100%	-	15-30 min Cool down	-
Salt Water Cure	Chemical-free Low strength	Mist Dip	Clear/ Color	-	Up to 100%	-	Variable	Variable
Functional Infiltrants								
Z-Max™	Maximum Strength Heat resistant	Brush Spray	Slightly yellow/ Color	100: 37 by weight	5-10	35 min	24 h	2 h
Specialty Infiltrants								
Por-A-Mold® Elastomer	Tough Flexible	Brush	Slightly yellow/ Color	1:1 by volume	2-5	15 min	24 h	-
Z-Bond 11 Investment Casting	Instant Cure For zp 14 only	Dip Drizzle	Clear/ Mono-chrome	-	2-3	-	15-30 min	-
Notes: Working time is the time during which the resin can be applied, before the curing reaction starts. Cure time is the point in time when the infiltrated part is cured and has achieved full strength. The ZW4 is a waxer available from Z Corporation authorized resellers.								

5.3 Infiltration for Concept Modeling

Concept Modeling Infiltrants are great for applications ranging from design iterations, product mock-ups, design & ergonomics review, and proof of concept to sales/marketing tools, teaching tools or movie props.

Z-Bond™ 101/Z-Bond 90

Z-Bond 101 is an extremely fast-curing infiltrant, designed to rapidly strengthen 3D-printed parts. Z-Bond 101 is a low odor formulation and is easy to apply. With Z-Bond 101 Premium Instant infiltrant, you can enjoy strong, vividly colored models in as little as 5 minutes.



Z-Bond 101 is the strongest and fastest concept modeling infiltrant and also one of the most lightfast, under office-type lighting.

Z-Bond 101 is also available in a Dipping Kit. This convenient kit has everything you need to easily and cleanly dip your parts. It includes two bottles of Z-Bond 101, a dipping container, funnel, safety glasses and gloves - all for the price of just the Z-Bond 101.

Z-Bond 90 is a fast-curing infiltrant for 3D-printed parts. It is a low odor formulation that makes strong and very colorful models.

Z-Bond 90 is the best value instant infiltrant and a great choice for many concept modeling applications.

Z-Bond 90 is available in a Dipping Kit as well. As with Z-Bond 101, the kit has everything you need including three bottles of Z-Bond 90, two dipping containers, funnel, safety glasses and gloves.

Paraplast X-TRA™ Wax

One of the most cost-effective infiltrant options for concept models is Paraplast X-TRA wax. Dipping the printed models in melted wax quickly enhances colors and fills the pores, for a smoother surface finish.

Paraplast X-TRA melts at a low temperature of 50°C (122°F) and will readily infuse the printed model and confer it some additional strength.

Paraplast X-TRA can be used with Z Corporation's ZW3 waxer and ZW4 automated waxer.

Salt Water Cure

Salt Water Cure is the safest and greenest way to infiltrate 3D-printed models. Simply mist your model (or dip it) using a salt water solution. Salt Water Cure is the lowest cost infiltration option and delivers the brightest white 3D models.

Concept Modeling Infiltrant Characteristics

- Easy and cost effective to use
- Seals and smoothes part surface
- Enhances color vibrancy
- Strengthens part for handling

Tech Tip

A little sanding goes a long way in improving the appearance of your models.

Before infiltration, take a minute to lightly sand away unevenness in the color of the part.

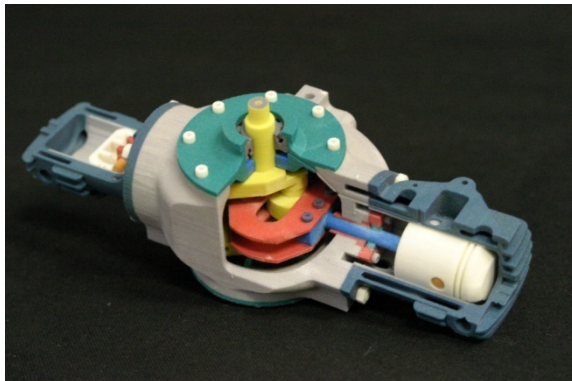
Once infiltrated the colors of the parts will be brighter and more uniform in appearance.



Infiltration Products for Concept Modeling

Our concept modeling infiltrants include Z-Bond™ 90 and 101, as well as Paraplast X-TRA™ wax and the new Epsom salt option.

concept modeling infiltrants		
Description	Unit of Measure	Part #
Z-Bond™ 101 Premium (small)	100 g (3.53 oz.)	15078
Z-Bond 101 Premium (large)	454 g (16 oz.)	15077
Z-Bond 90 Economy	454 g (16 oz.)	Z0096 (pkg. 2)
Z-Bond 90 Economy (large)	2 kg (4.4 lb)	50349
Z-Bond 101 Dipping Kit	2x 454 g (1 lb.) Dipping container Gloves, towels, funnel	50301
Z-Bond 90 Dipping Kit	3x 2 kg (3 x 4.4 lb.) Dipping container (2) Gloves, towels, funnel	50392
Paraplast X-TRA	1 kg (2.2 lb.)	10434 (pkg. 8)
Epsom Salt	0.6 kg (22 oz.)	16743



Z-Bond 101 and Z-Bond 90



Z-Bond 101 Dipping Kit



Z-Bond 90 Large

5.4 Infiltration for Functional Modeling

Functional Infiltrants are great for more demanding applications such as fit testing, functional testing, tooling or molding.

Z-Max™

Z-Max is the infiltrant of choice for the user who needs prototyping functionality from their parts. A part infiltrated with Z-Max allows engineers and designers to quickly test design iterations without the cost and time associated with waiting for molded plastic parts. Once infiltrated, parts can easily be machined, tapped, sanded, and painted. Z-Max will give you a very hard, very rigid, and very strong part.

Z-Max is a high strength infiltrant. It is a two-part epoxy system, formulated to support needs not met by any product currently on the market. The primary factors are performance and convenience.

Performance: Z-Max is a low viscosity formulation, which means deeper, quicker penetration. The result is very strong models, up to 43 MPa of flexural strength and up to 98 MPa of compression strength. Parts made with Z-Max are hard and rigid so they don't deform under load. Z-Max also has good temperature resistance, with a Heat Deflection Temperature (HDT @ 66 psi) of 115°C. *

Convenience: Z-Max has 35-45 minutes of working time, allowing plenty of time for careful application.

After infiltration, Z-Max infiltrated parts cure at room temperature in 12-24 hours. The use of an oven for the cure cycle reduces the cure time to just 2 hours, producing consistently strong parts quickly.

Parts treated with Z-Max High Strength infiltrant can be sanded, drilled, tapped or machined, as needed.

* Source: Independent A2LA-accredited laboratory.

Functional infiltrants		
Description	Unit of Measure	Part #
Z-Max Large	2.86 kg (0.7 gal.)	14505

Functional Modeling Infiltrant Characteristics

- Easy and cost effective to use
- Seals part surface
- Strengthens part
- Resistant to temperature and humidity

Tech Tip

When applying Z-Max, a heat gun is a good tool to use to retain fine feature detail.

When heat is applied to an area of the part the viscosity of the epoxy drops locally, allowing it to more easily wick in. This helps to preserve the quality of the part.



Z-Max Large

5.5 Specialty Infiltration

Por-A-Mold® Elastomer

Por-A-Mold elastomer is used to give parts printed with zp® 15e powder their elastomeric properties. This two-part urethane is mixed and then brushed onto the part, until it is infused completely. The part must then cure at room temperature for 24 hours. This will produce a very flexible part, yielding a Shore A Hardness of 28±2.

Z-Bond™ 11

Z-Bond 11 can be used instead of wax to prepare parts printed with zp 14 before the process of investment casting or lost wax. Dipping a 3D-printed part into a hot wax bath may introduce deformation. Z-Bond 11 reacts at room temperature, to preserve the geometrical accuracy of the model and lends the pattern significantly more strength and integrity than wax would.

Note: Paraplast X-TRA™ can be used after infiltration with Z-Bond 11 to make the pattern's surface smoother.

specialty infiltrants		
Description	Unit of Measure	Part #
Por-A-Mold Elastomer	1.9 L (2 qt.)	20093
Z-Bond 11	220 g (7.76 oz.)	15079

Tech Tips for Elastomeric Urethane

- Mix the material in small batches
- Apply the first coat very liberally
- Additional coats should be lighter
- Be ready to dab off excess material
- Once a part has been infiltrated, be careful not to leave the part sitting in a puddle of material, as it will be difficult to cut off afterwards.



Por-A-Mold

6 Resources

All consumable items can be ordered online through our Z Shop™ web store found in the ZCentral™ web site, zcentral.zcorp.com. If you are not a North American customer, please contact your authorized sales representative for ordering information.

Ordering inquiries can also be directed to our Customer Development team at: ussupplies@zcorp.com.

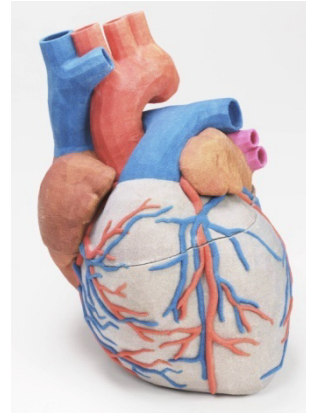
Technical application inquiries can be directed to our Applications team at: applications@zcorp.com.

Service related inquiries can be directed to our Service team at: service@zcorp.com.

Z Corp's annual ZNet User Group Meeting is another valuable resource to learn and share new applications with other 3DP™ users and our applications team. Visit ZCentral for more information.

Also on our ZCentral web site, you'll find:

- Latest Updates and Information
- Technical Application Notes
- User Guides
- Design Guides
- Best Practices
- User Training
- Knowledge Base
- Software Help
- 3DP User Group
- ZCentral Message Board
- Software and Firmware Downloads
- Product information including our line of printers and consumables
- MSDS information
- Z Shop



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