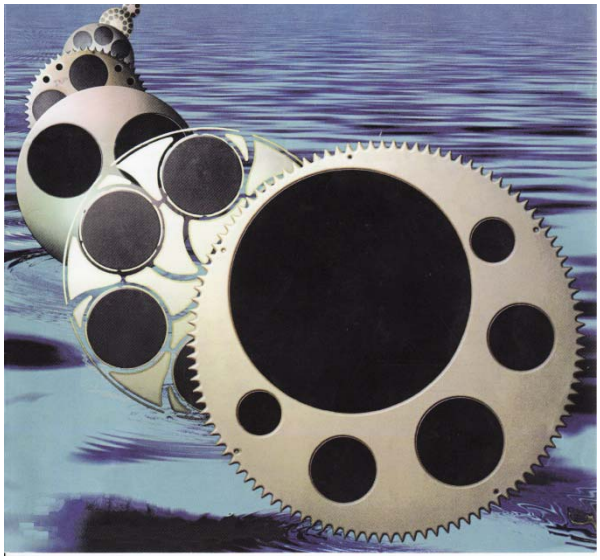
ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PRODUCT CATALOG

NOTE: This catalog is produced using Adobe Acrobat and is best accessed using the bookmark function in Adobe Reader.

ZEROMICRON®

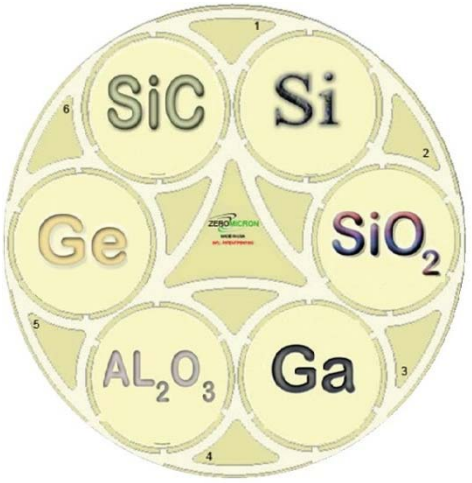
ENHANCING SURFACE TECHNOLOGY



Polishing Templates
Pad Dressers
Polish Head Adapters
Process Development
Geared Templates
Quick Change Templates & Pads

Solutions designed and engineered for any material:

Germanium
Silicon Carbide
Sapphire
Diamond
Quartz
Silicon
Gallium
Indium
Etc.



ZeroMicron Inc. 2330 South Tenth Street San Jose, CA 95112-4109
Tel: 1(408) 441-4600 Fax: 1(408) 441-9404
www.ZeroMicron.com info@ZeroMicron.com

ZeroMicron Family of Polishing Templates for Wafers and Components

New Classic

Low Cost Template

The New Classic (NC) template resembles the common template available from other suppliers but it is not the same.

The NC template is built with a rigid frame of G-10 select grade material and a polyurethane poromeric insert that provides excellent water adhesion and very low compression properties.

Our template is not a simple framed product that is weakly glued to a porous surface.

Our templates have seven layers of construction that incorporates our anti-delamination features and high temperature adhesive to deliver superior performance and the maximum process runs per template life time ratio.

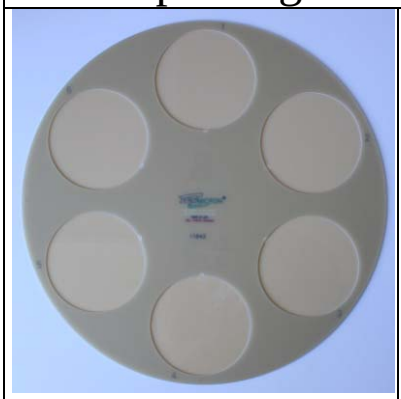
NC templates can be adjusted for optimal wafer protrusion that maximizes polishing performance and minimizes wafer blow outs.

An old familiar product redesigned: with higher strength, longer life, better performance and the savings of the lowest cost per run.

New Classic templates have created a new paradigm in consumable costs.

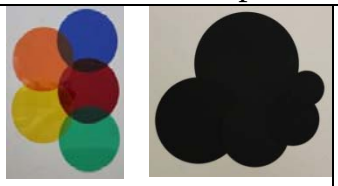
Reliable, repeatable performance over a longer product life time reduces the cost of Wafer production and adds that savings to your bottom line.

Spinning Shim System Templates



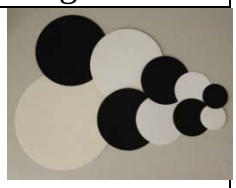
Standard Template

Chemical Introducing Groove



Spinning Shim System

Shimsert System



Padsert System

The Spinning Shim System is available in all polishing head sizes for all wafer sizes in either a standard template design or a template with Chemical Introducing Grooves (CIG). The grooves are used to apply slurry directly to the wafer and can reduce slurry usage substantially.

There are three systems used with the Spinning Shim Template, the Spinning Shim System (S3), the Shimsert System (SS) and the Padsert System (PS), each with its own unique advantages. Each designed for a specific market and application.

The S3 allows for the maximum flexibility to adjust for polishing exposure with the use of individual PET (PolyEthylene Terephthalate) shims and a polyurethane poromeric insert. Single shims can be used to adjust in 1 mil increments and multiple shims can be used on a single template to allow various thickness wafers to be polished using a single template.

The SS is a one piece system that has the PET shim bonded to the poromeric insert to make handling easier. These are available in all wafer sizes and with a wide selection of shims for maximum flexibility. The SS family is designed for polishing times that are less than 20 minutes. The SS inserts are directly replaceable with the S3.

The PS is a one piece system that has the PET shim bonded between a polishing pad and the poromeric inset. This system was specifically designed for long polishing processes to withstand the harsh conditions of polishing such materials as Sapphire. The PS system requires a template that is specifically designed for the added thickness.

ZeroMicron Family of Polishing Templates for Wafers and Components

Pad Pocket System Templates

Pad Pocket (PP) Template

PP with CIG

Spinning Shim System

Shimsert System

The Pad Pocket System is available in all polishing head sizes for all wafer sizes in either a standard template design or a template with Chemical Introducing Grooves (CIG). The grooves are used to apply slurry directly to the wafer and can reduce slurry usage substantially.

There are two systems used with the Spinning Shim Template, the Spinning Shim System (S3) and the Shimsert System (SS) which operate as described in the Spinning Shim System (at left).

The advantage of the Pad Pocket System is in the longevity of the PET (PolyEthylene Terephthalate) pocket base with the PadSert insert. The PadSert has polishing pad material on the bottom with polyurethane poromeric material on the top to provide very strong water retention of the work-piece. This combination provides a very long lasting insert that can withstand extreme temperatures.

This system is designed to withstand harsh conditions and provide a reliable and consistent product. With attention paid to wafer protrusion, edge condition and proper tool parameters there is an extended life cycle for the template.

In addition, the pockets can be supplied with special features to adjust for edge profiles, bow and taper conditions

Longer template life equals less down time, lower costs per run, lower costs per part and greater overall profitability.

Components

Chip Template

ZeroMicron offers specialized templates for many polishing needs. The template pictured above is a "template-in-template" and multiple units can mount in a Standard Template.

The pictured chip template is for 30mm X 30mm square optical plates. These mini-templates are available in single or multiple piece holders like the four piece holder shown above.

These are available with and without CIG as pictured above.

Custom inserts are available for any size or shape work piece. Round, square, triangular, rectangular as well as irregular have all been supplied.

ZeroMicron Specialty Products

Pad Dressers

From left to right:
Diamond pad dresser with rotating diamond pucks.
Mini insert pad dresser for wafer polish frame.
Captive spinning pad dresser.
Polish head mount pad dresser.

Geared Templates

Geared templates can be supplied to the specific user requirement. These can be used on a double sided polisher or lapper for single sided polishing or lapping. In the case of the template pictured on the left, for double sided polishing or lapping. Gearing is available for most common polishers and custom gearing can be supplied.

Special Products

ZeroMicron can develop designs for custom applications as well as the development of industry wide solutions to polishing problems.

The products shown in this brochure are only a sample of the product offered.

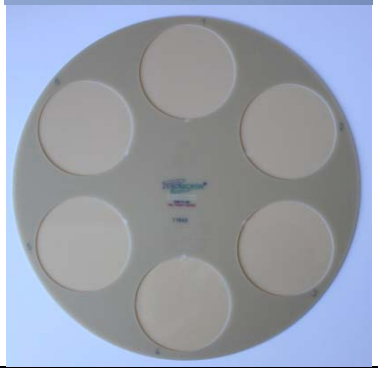
If you have a specific issue or problem that needs to be addressed, please contact our development group.

GREEN PROCESS
A DIVISION OF ZEROMICRON®

Green Process Inc. is a wholly owned subsidiary of ZeroMicron Inc. engaged in the development of process equipment.

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE FOR SHIM SPINNING SYSTEM, SHIMSERT AND PADSERT SYSTEMS



Above - 300mm with CIG
Left - 100mm with and without CIG

This family of Templates is designed to accept the ZeroMicron patented Shim Spinning System (S3), the ShimSert System (SS) and the PadSert System (PS).

The templates for the Shim Spinning System and the ShimSert System are all interchangeable. The templates for the PadSert System require a slightly deeper pocket to accommodate the thicker pad.

The Shim Spinning System uses a shim made of PET (PolyEthylene Terephthalate) to insure proper wafer protrusion for polishing. The shim is placed in the bottom of the wafer pocket. An insert, made of a polyurethane poromeric material, is placed on top of the shim. All materials are inserted in a wet condition to take advantage of the condition known as "water adhesion".

The advantage of the Shim Spinning System is that multiple shims can be used to adjust for wide variations in wafer thickness.

The ShimSert System was developed to simplify the shim handling. In this system the PET shim and poromeric material are bonded together. This means that the user only has one part to handle.

The pocket is flushed and cleaned and left wet. The ShimSert is installed with the shim side down and the poromeric material is flushed and left wet.

The PadSert System was invented to fill a special requirement for a system that would spin the wafer for extended periods of time under high pressure to achieve high removal rates on hard materials such as Sapphire and Silicon Carbide.

Advantages of the ZeroMicron S3, SS and PS Systems:

Spinning wafers. Wafers that sit in the template mounted to a polishing head without spinning have more material removed from the outer edge of the template where the surface velocity over the polishing pad is higher. These wafers have a tendency to be "wedge" shaped. Even a fine tuning of the process to even the surface as much as possible usually results in an uneven pattern with significantly more roll-off on the outer edge. With the additional outer edge material removal, there are uneven heat problems and other issues.

Wafers that rotate within the pocket receive a more even polishing. It is easier to control the edge condition with an even polishing. Care must be taken to insure that the slurry is distributed fully across the polishing pad and with the wafer rotating within the rotating polish head an even finish can be applied.

Slurry distribution. The S3, SS and PS templates are available with Chemical Inducing Grooves (CIG). This is a ZeroMicron patented innovation where grooves are machined into the face of the template. A standard commercial template relies on the polishing pad to be flooded with slurry and to carry the slurry under the wafer as it is pressed onto the pad. ZeroMicron can supply all three versions of the wafer spinning technology in a standard template or ZeroMicron can supply the patented CIG technology.

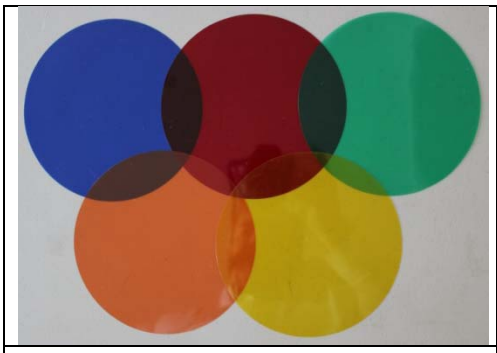
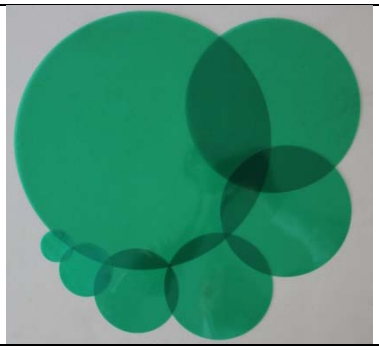
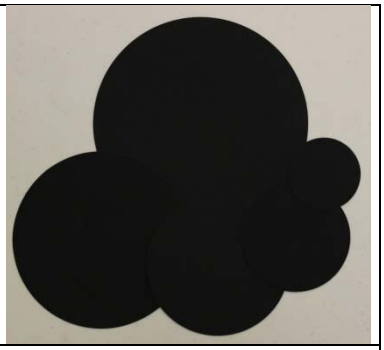
The CIG technology allows the slurry to flow into the template and routes it to the wafer. With the slurry being directed onto the wafer rather than being slung off the platen, less slurry can be applied. CIG is designed for the specific material requirements. For example, soft materials such as Germanium require a higher slurry flow and those templates use a wider groove. Hard materials like Sapphire require a stronger wafer pocket wall. CIG patterns are specific for the material being polished.

- ***Wafer rotating provides a more even finish.***
- ***The S3 allows for maximum flexibility for wafer protrusion.***
- ***The ShimSert System provides an easy handling package.***
- ***The PadSert System is designed for hard materials and long polishing sessions.***
- ***CIG is used for lower slurry requirements and greater savings.***
- ***CIG with rotating wafers provides for faster stock removal.***

Contact: ZeroMicron Inc. 2330 South Tenth Street San Jose, CA 95112-4109 Tel: 1-408-441-4600 / Fax: 1-408-441-9404 Email: info@zeromicron.com	

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

"S3" SHIM SPINNING SYSTEM

<table>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Color coded shims</td><td>Available in all wafer sizes</td><td rowspan="2">Insert - Polyurethane poromeric material</td></tr>
<tr><td colspan="2">PET (PolyEthylene Terephthalate) material</td></tr>
</table>

The Shim Spinning System was developed and patented by ZeroMicron to provide an even polish and stock removal by allowing the wafer to rotate in the template pocket. If a wafer is placed in a template and held in one position, more material will be removed from the outer edge where the velocity over the polishing pad is greater.

This creates several problems including a possible "wedge" condition, roll off that may exceed the limits of the EE (Edge Exclusion) zone and heat problems across the surface where the outer edge has more heat generation.

The Shim Spinning System was invented to solve this problem. The S3 allows the wafer to rotate in the template pocket as it is polished. This rotating action will provide a more even polish.

The system works by using a template designed for wafer spinning and inserting a shim made of PET (PolyEthylene Terephthalate) and of desired thickness to provide proper wafer protrusion. The shim is inserted in a clean and wet pocket. An insert, made of a polyurethane poromeric material, is placed on top of the shim. All materials are inserted in a wet condition to take advantage of the condition known as "water adhesion".

To achieve the proper water adhesion it is important that the user press the porometic material into the pocket and remove all air pockets, bubbles, etc. and provide a flat surface for the wafer. The poromeric material used by ZeroMicron has been specially selected to have higher adhesion properties with lower compression rates for longer life.

The template housing is constructed in a manner to allow rugged handling and the PET material and polyurethane poromeric materials were all selected to withstand a vigorous installation. This is

important for the proper application as the wafer will not be processed properly if there is an uneven surface.

Unlike competitor templates where distortions and air pockets can remain undetected, ZeroMicron templates are designed to allow the user to eliminate these problems at every step with careful application and observation by the user.

The other reason that the flatness of the poromeric insert is very important is that this material and the wafer form a bond that retains the wafer in the pocket when the polishing head is lifted.

Advantages of the ZeroMicron Spinning Shim System:

Spinning wafers. Wafers that rotate within the pocket receive a more even polishing. It is easier to control the edge condition with an even polishing. Care must be taken to insure that the slurry is distributed fully across the polishing pad and with the wafer rotating within the rotating polish head so that an even finish can be applied.

Adjustable contour. Special PET designs can be provided to adjust the polishing to correct for cupping (warp) or bow as well as some edge conditions or desired special effects. These issues should be discussed with our engineering and development team.

Replace the shim, not the template. Typically the template does not deteriorate, the wear is placed on the PET material and the poromeric material which are easily replaced. Reports from users state that they have been able to make several hundred runs on Silicon and fifty to one hundred runs on Sapphire without replacing the template and only inserting new PET and poromeric materials.

Adjustable protrusion. One of the most important issues for achieving proper surface finish and preventing blow outs is wafer protrusion. With this system, various thickness PET material can be used to adjust the wafer protrusion. Multiple shims can to used to increase the potential range of wafer thicknesses for a single template rather than stocking multiple templates and polishing heads.

- ***Wafer rotating provides a more even finish with better geometries.***
- ***The S3 allows for maximum flexibility for wafer protrusion.***
- ***Special contour issues can be addressed with this system.***
- ***The costs can be very low by replacing the PET and insert material, not the template .***
- ***By replacing the PET and poromeric material, costs per run can be greatly reduced.***
- ***Reduces lost time for template replacement .***
- ***Reduced template replacement equals less handling and carrier damage.***
- ***Reduces the polish head stocking requirements.***

Contact: ZeroMicron Inc. 2330 South Tenth Street San Jose, CA 95112-4109 Tel: 1-408-441-4600 / Fax: 1-408-441-9404 Email: info@zeromicron.com	

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

SHIMSERT SYSTEM

ShimSerts - color coded PET material on back, polyurethane poromeric material on front side

The ShimSert System (SS) was developed at the request of several clients to simplify the S3 (Spinning Shim System). This system joins the polyurethane poromeric material and the PET (PolyEthylene Terephthalate) material into a single part. While this still provides an even polish and stock removal by rotating the wafer in the template pocket,. it greatly simplifies the handling.

If a wafer is placed in a template and held in one position, more material will be removed from the outer edge where the velocity over the polishing pad is greater. This creates several problems including a possible "wedge" condition, roll off that may exceed the limits of the EE (Edge Exclusion) zone and heat problems across the surface where the outer edge has more heat generation.

The Spinning Shim System was invented to solve this problem and the ShimSert System was developed to simplify the handling. The SS allows the wafer to rotate in the template pocket as it is polished. This rotating action will provide a more even polish.

The system works by using a template designed for wafer spinning and inserting a shim made of PET (PolyEthylene Terephthalate) and of desired thickness to provide proper wafer protrusion. The shim is bonded to an insert made of a polyurethane poromeric material. This is placed in the pocket with the poromeric material face up in the template pocket. All materials are inserted in a wet condition to take advantage of the condition known as "water adhesion" to retain the wafer.

To achieve the proper water adhesion it is important that the user press the poromeric material into the pocket and remove all air pockets, bubbles, etc. and provide a flat surface for the wafer as this helps. retain the wafer in the pocket when the polishing head is lifted

Unlike competitor templates where distortions and air pockets can remain undetected, ZeroMicron templates are designed to allow the user to eliminate these problems at every step with careful application and observation by the user.

Advantages of the ZeroMicron Shimsert System:

Spinning wafers. Wafers that rotate within the pocket receive a more even polishing. It is easier to control the edge condition with an even polishing. Care must be taken to insure that the slurry is distributed fully across the polishing pad and with the wafer rotating within the rotating polish head an even finish can be applied.

Adjustable contour. Special PET designs can be provided to adjust the polishing to correct for cupping or bow as well as some edge conditions or desired special effects. These issues should be discussed with our engineering and development team.

Replace the ShimSert, not the template. Typically the template does not deteriorate, the wear is placed on the PET material and compression on the poromeric material which, as a single assembly, is easily replaced. Reports from users state that they have been able to make several hundred runs on Silicon without replacing the template and only replacing the insert.

Adjustable protrusion. One of the most important issues for achieving proper surface finish and preventing blow outs is wafer protrusion. With this system, various thickness PET material can be used to adjust the wafer protrusion. The inserts can be supplied in virtually any thickness required by bonding various thickness PET materials to the poromeric material to keep compression to a minimum.

Limitations. Due to the loss of one PET to PET interface with this system, there is a limitation on this design and it should only be used on applications where the polish time is less than 20 minutes. For applications requiring longer periods, please see the PadSert System.

- ***Wafer rotating provides a more even finish.***
- ***The ShimSert System allows for maximum flexibility for wafer protrusion.***
- ***Special contour issues can be addressed with this system.***
- ***The costs can be very low by replacing the ShimSert, not the template .***
- ***Costs per run can be a fraction of the cost of a conventional template.***
- ***Reduces lost time for template replacement as well as polish head stocking requirements.***

Contact: ZeroMicron Inc. 2330 South Tenth Street San Jose, CA 95112-4109 Tel: 1-408-441-4600 / Fax: 1-408-441-9404 Email: info@zeromicron.com	

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

NEW CLASSIC TEMPLATE FOR WAFER POLISHING

Low Cost Template

24 inch template, 5 pocket, 200mm wafers

14.69 inch template, 1 pocket, 300mm wafer

The New Classic Template is a direct replacement for the common production template available through several major suppliers. It is available in all of the popular polishing head sizes and can be supplied for all of the conventional wafer sizes. This template is available with pocket depths to provide the proper wafer protrusion while polishing.

In keeping with the convention for the common production template, this product has an adhesive backing to hold the template on the polishing head and a polyurethane based poromeric material in the base of the pocket.

The poromeric material allows moisture to saturate without the absorption that would occur for example, with a sponge like material that would increase in size. This poromeric property allows the moisture to hold the wafer with a high adhesion force (a property known as "Water Adhesion").

At that point the similarities between the common production template and the ZeroMicron New Classic Template cease and the unique capabilities of the ZeroMicron product become apparent.

Advantages of the ZeroMicron New Classic Template:

Template mounting. Common production templates do not allow you to see how well the template is being mounted. ZeroMicron templates use a semi-opaque rigid material that allows the user to see any bumps, bubbles or irregularities in the mounting. Air pockets and bubbles in the template mounting are the largest cause of template failures, blow-outs and improperly polished wafers. Templates need to be mounted with care, especially in the pocket area, to insure that air is not trapped between the template and polishing head.

Anti-delamination structure. ZeroMicron New Classic Templates are designed to keep the wafer centered within the pocket for proper protrusion and prevent the wafer from jumping out of the pocket during operation when the tools are operated within proper high production process limits. The template is also designed to insure that the wafer will not cause a separation of the frame and backing with a unique six piece structure that provides very high strength in the production environment.

Wafer protrusion adjustment. All templates use a pocket depth adjustment insert to insure that the wafer protrusion is proper. Proper wafer protrusion is one of the most important issues. Too much protrusion can result in blow-outs and too little protrusion can result in improper polishing. This feature is only available on ZeroMicron templates.

Rugged design. A rigid frame of G-10 material that conforms to Mil Spec I-24768/27 provides a high strength structure. A special high strength, high temperature adhesive is used to join the materials and a unique structure of the poromeric material resists compression.

Template longevity. The rugged design of this product has proven to provide the user with three to four times the life of a common production template. With low blow-out rates, a rigid structure, the delamination prevention feature and by paying close attention to proper wafer protrusion, this template has been tested and proven to outlast the common production template.

Low template cost. This template is priced competitively with other suppliers but with the extended life, is actually, on average, half of the cost of the common production template. When you add in the downtime saved from not having to remove and replace a template the savings increase dramatically.

- ***Better mounting for better production.***
- ***Fewer blow-outs and rejected parts.***
- ***Fewer blow outs equal less tool damage.***
- ***Anti-delamination design.***
- ***Longer life, multiple run capability.***
- ***Longer life equals less lost time for template changes.***

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE WITH PADPOCKET FOR SHIM SPINNING SYSTEM AND SHIMSERT SYSTEM

PadPocket Template with CIG

Standard PadPocket Template

This family of Templates is designed to accept the ZeroMicron patented Shim Spinning System (S3) and the ShimSert System (SS). The templates for the Shim Spinning System and the ShimSert System are all interchangeable.

The Shim Spinning System uses a shim made of PET (PolyEthylene Terephthalate) to insure proper wafer protrusion for polishing. The shim is placed in the bottom of the wafer pocket. An insert, made of a polyurethane poromeric material, is placed on top of the shim. All materials are inserted in a wet condition to take advantage of the condition known as "water adhesion".

The advantage of the Shim Spinning System is that multiple shims can be used to adjust for wide variations in wafer thickness.

The ShimSert System was developed to simplify the shim handling. In this system the PET shim and poromeric material are bonded together. This means that the user only has one part to handle. The pocket is flushed and cleaned and left wet. The ShimSert is installed with the shim side down and the poromeric material is flushed and left wet.

The advantage of the PadPocket System is in the longevity of the polishing pad material in the bottom of the template pocket. Instead of eventually wearing out the pocket due to slurry working

on the PET (PolyEthylene Terephthalate) shims, the lower surface is now a polishing pad that is designed for such punishing applications. To help with the longevity, the polyurethane poromeric insert materials have been carefully selected for best water adhesion with minimum compression especially in environments where high pressures are used for extended periods of time.

The PadPocket Template is available in all polishing head sizes for all wafer sizes in either a standard template design or a template with Chemical Introducing Grooves (CIG). The grooves are used to apply slurry directly to the wafer and can reduce slurry usage substantially.

This system is designed to withstand harsh conditions and provide a reliable and consistent product. With attention paid to wafer protrusion, edge condition, proper tool parameters there will be an extended life cycle for the template.

Advantages of the ZeroMicron PadPocket used with the S3 and SS Systems:

Polishing pad in the pocket. With a polishing pad in the template pocket there is virtually no wear on the base of the pocket and , with proper care of the wafer protrusion, slurry flow, process control and cleaning of the template after each run, this template is designed to provide an extremely long service life.

Spinning wafers. Wafers that sit in the template mounted to a polishing head without spinning have more material removed from the outer edge of the template where the surface velocity over the polishing pad is higher. These wafers have a tendency to be "wedge" shaped. Even a fine tuning of the process to even the surface as much as possible usually results in an uneven pattern with significantly more roll-off on the outer edge.

Wafers that rotate within the pocket receive a more even polishing and it is easier to control the edge condition to achieve a better surface finish.

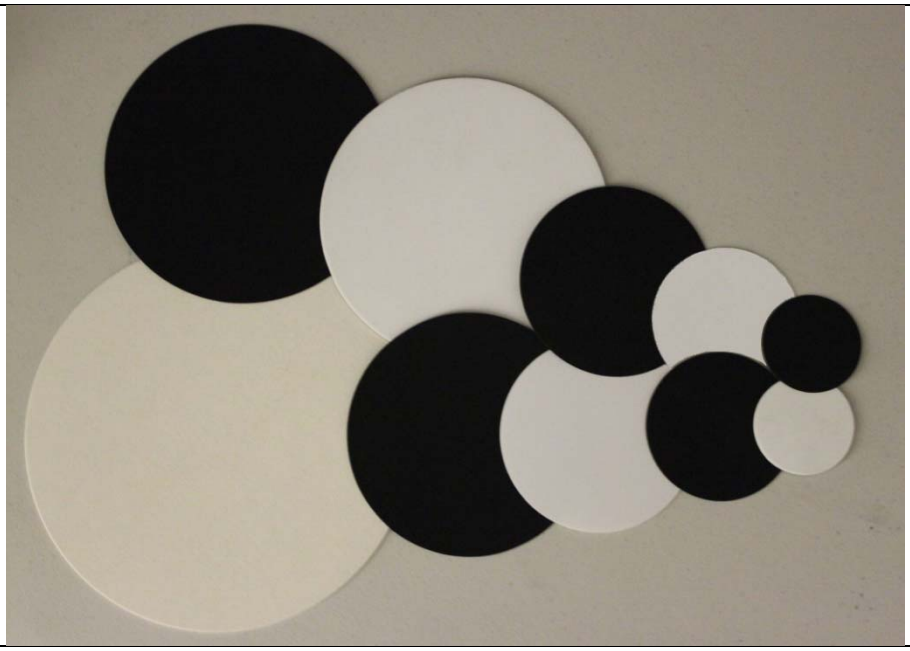
Slurry distribution. The PadPocket templates are available with Chemical Inducing Grooves (CIG). This is a ZeroMicron patented innovation where grooves are machined into the face of the template. A standard commercial template relies on the polishing pad to be flooded with slurry and to carry the slurry under the wafer as it is pressed onto the pad. The CIG technology allows the slurry to flow into the template and routes it to the wafer resulting in the need for less slurry to be applied. CIG is designed for the specific material requirements. ZeroMicron can supply the PadPocket template in a standard template version or the ZeroMicron patented CIG configuration.

- ***Pad in the template pocket provides extremely long life.***
- ***Wafer rotating provides a more even finish.***
- ***The S3 allows for maximum flexibility for wafer protrusion.***
- ***The ShimSert System provides an easy handling package.***
- ***CIG is used for lower slurry requirements and greater savings.***
- ***CIG with rotating wafers provides for faster stock removal.***

Contact: ZeroMicron Inc. 2330 South Tenth Street San Jose, CA 95112-4109 Tel: 1-408-441-4600 / Fax: 1-408-441-9404 Email: info@zeromicron.com	

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PADSERT SYSTEM



Padserts are PET (PolyEthylene Terephthalate) material sandwiched between a round polyurethane poromeric material and round polishing pad material

The Padsert System (PS) was developed at the request of several clients to simplify the S3 (Shim Spinning System) and provide a wafer spinning system that would run for extended periods of time. For a one piece solution for polishing times that do not exceed 20 minutes, see the Shimsert System (SS).

This system joins the polyurethane poromeric material and the polishing pad material with PET (PolyEthylene Terephthalate) material in the middle into a single part. While this still provides an even polish and stock removal by rotating the wafer in the template pocket, it greatly simplifies the handling.

If a wafer is placed in a conventional template, which holds it in one position, more material will be removed from the outer edge where the velocity over the polishing pad is greater. This creates several problems including a possible "wedge" condition, roll off that may exceed the limits of the EE (Edge Exclusion) zone and heat problems across the surface where the outer edge has more heat generation.

The Spinning Shim System was invented to solve this problem and the Padsert System was developed to simplify the handling. The PS allows the wafer to rotate in the template pocket as it is polished. This rotating action will provide a more even polish.

The system works by using a template designed for wafer spinning and inserting a Padsert into the template pocket. The Padsert, while slightly more expensive than the Shimsert, can withstand long periods of high pressure polishing. A spacing shim of PET (PolyEthylene Terephthalate) material is bonded on top of the polishing pad to provide the proper thickness for the wafer protrusion. A piece of poromeric material is bonded to the top to complete the assembly. This one piece assembly is placed in the pocket with the poromeric material face up in the template pocket. All materials are inserted in a wet condition to take advantage of the condition known as "water adhesion" to retain the wafer.

To achieve the proper water adhesion it is important that the user press the poromeric material into the pocket and remove all air pockets, bubbles, etc. and provide a flat surface for the wafer as this helps retain the wafer in the pocket when the polishing head is lifted

Advantages of the ZeroMicron Padsert System:

Spinning wafers. Wafers that rotate within the pocket receive a more even polishing. It is easier to control the edge condition with an even polishing. Care must be taken to insure that the slurry is distributed fully across the polishing pad and with the wafer rotating within the rotating polish head an even finish can be applied.

Adjustable contour. Special PET designs can be provided to adjust the polishing to correct for cupping or bow as well as some edge conditions or desired special effects. These issues should be discussed with our engineering and development team.

Replace the Padsert, not the template. Typically the template does not deteriorate, the wear is placed on the polishing pad material and compression on the poromeric material which, as a single assembly, is easily replaced. Initial test results show that the Padsert will run for several hundred hours if proper wafer protrusion is used.

Adjustable protrusion. One of the most important issues for achieving proper surface finish and preventing blow outs is wafer protrusion. With this system, various thickness PET material can be used to adjust the wafer protrusion. The inserts can be supplied in virtually any thickness required by bonding various thickness PET materials between the polishing pad and the poromeric material.

- ***Wafer rotating provides a more even finish.***
- ***The Padsert System allows for maximum flexibility for wafer protrusion.***
- ***Special contour issues can be addressed with this system.***
- ***The costs can be very low by replacing the Padsert, not the template .***
- ***Costs per run will provide a significant cost savings.***
- ***Reduces lost time for template replacement as well as polish head stocking requirements.***

Contact: ZeroMicron Inc. 2330 South Tenth Street San Jose, CA 95112-4109 Tel: 1-408-441-4600 / Fax: 1-408-441-9404 Email: info@zeromicron.com	

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

QUICK CHANGE POLISHING PAD

The Quick Change frame with Quick Change pad installed is shown at the left.

This assembly is comprised of three parts, the G-10 frame that mounts permanently to the platten, a G-10 pad holder and the pad mounted to the pad holder.

The pad and pad holder assembly are held in place with the four tabs around the edge.

The pad and pad holder can be removed and replaced in less than one minute.

The Quick Change Polishing Pad removes the hassle of stripping the old pad from the polishing platen and the aggravation of installing a new polishing pad. This Quick Change system also eliminates the potential damage to the platen during the pad removal saving valuable down time and expense refinishing of damaged surfaces.

The Quick Change Pad Holder is mounted on the platen surface. The pad holder bottom surface is milled flat and air release grooves are cross-hatched into the bottom surface. The surface is then resurfaced to insure maximum flatness. The inner surface is then machined flat and parallel to the bottom surface.

A polishing pad backing plate that is similarly manufactured to control the flatness and parallelism is used to mount the polishing pad. The polishing pad is mounted to the backing plate in the convention manner with a glue layer. The polishing pad and the backing plate have four notches that hold the pad in place on the pad holder.

The pad backing plate with pad attached are completely independent of the pad holder mounted on the platen. To change polishing pads simply remove the pad and backing plate by lifting the assembly out of the pad holder and replace it with a new assembly. The old pad can be replaced off-line with no loss of equipment production and no damage to the tool.

Advantages of the ZeroMicron Quick Change Polishing Pad:

Pad Holder mounting. Common production templates do not allow you to see how well the template is being mounted. ZeroMicron templates use a semi-opaque rigid material that allows the user to see any bumps, bubbles or irregularities in the mounting. Further, the Pad Holder has air release grooves cut into the back surface to insure that the pad holder mounts very flat to the polisher platen.

Anti-delamination structure. ZeroMicron Templates are designed and constructed using high temperature and high pressure techniques and materials to allow the polisher to operate at up to 68 degrees Centigrade for extended periods without delamination.

Rugged design. A rigid frame of G-10 material that conforms to Mil Spec I-24768/27 provides a high strength Pad Holder structure. A special high strength, high temperature adhesive is used to join the Pad Holder to the platen. The same adhesive is used to mount the polishing pad to the pad backing plate.

Pad Holder longevity. The rugged design of this product has proven to provide the user with a permanent system for quick pad changes. Various pads can be mounted on the pad backing plate and normal wear can be expected. However, the pad can be changed on the pad backing plate off line from the polishing operation and the pad backing plate is also constructed of rigid G-10 material.

Low cost production. This Quick Change Pad Holder system provides a method to quickly change the polishing pad without pealing the pad off the platen, scraping the glue, potentially damaging the platen, laying down adhesive and reattaching a new polishing pad. This assembly allows the pad to be replaced off-line and changed on the production line in less than one minute.

- ***Better mounting for better production.***
- ***Built-in air release grooves to insure flat mounting of the Pad Holder.***
- ***Built-in air release grooves to insure flat mounting of the pad onto the backing plate.***
- ***Off-line polish pad mounting.***
- ***Quick change of polishing pads.***
- ***Allows polishing pad types to be changed without destruction of the used pad.***
- ***Ideal for experimental or University use.***

Contact: ZeroMicron Inc. 2330 South Tenth Street San Jose, CA 95112-4109 Tel: 1-408-441-4600 / Fax: 1-408-441-9404 Email: info@zeromicron.com	

Geared Templates

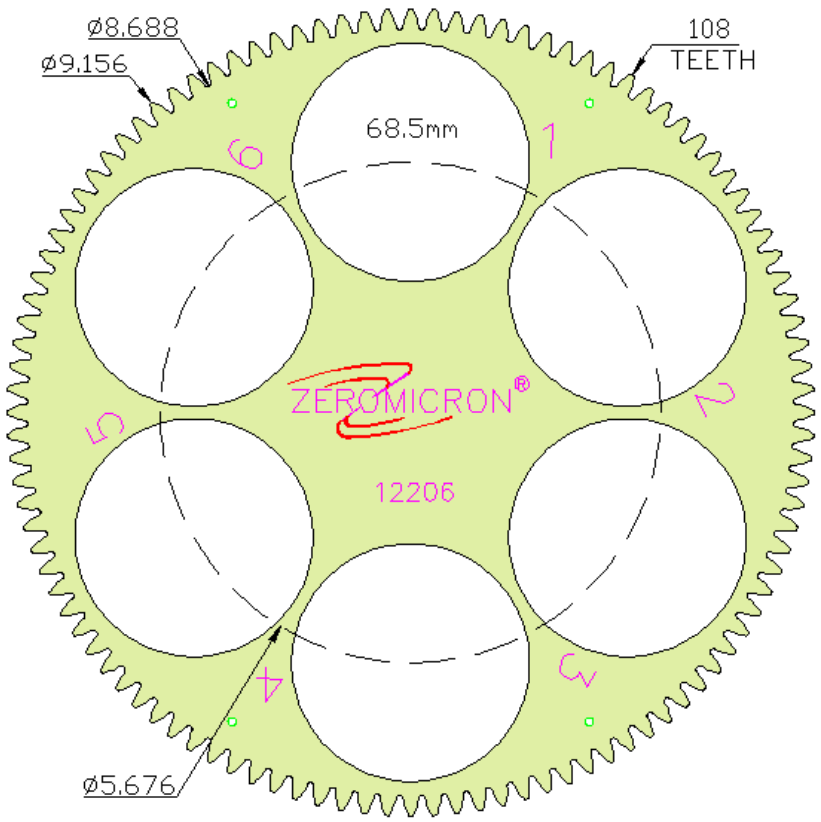
Geared templates are designed to fit a specific tool, for example, Peter Wolters, Speedfam or Strasbaugh among others. These tools have specific geometries that dictate the diameter and gear tooth design of the template.

The geared templates shown represent only a small selection of the products offered by ZeroMicron.

Single side, double side and double single side templates are all available. The double single side template has pockets for the work pieces back-to-back.

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

GEAR TEMPLATE: 9.156" OD - 8.688" ROOT DIA. - 108 TEETH



OD = Outside Diameter of the Gear Teeth
= 9.156 inches

Root Diameter is the Diameter at the base of the Gear Teeth
= 8.688 inches

Number of Teeth = 108

Work Piece Size
= 68.5 mm

Number of Work Pieces
= 6

Standard construction
= G-10 laminate.
G-11 high temperature material available.

This Catalog Item defines the configuration and features of this Gear Template (#12206).
ZM part #'s are assigned to define the exact Gear Template with the required work piece size.

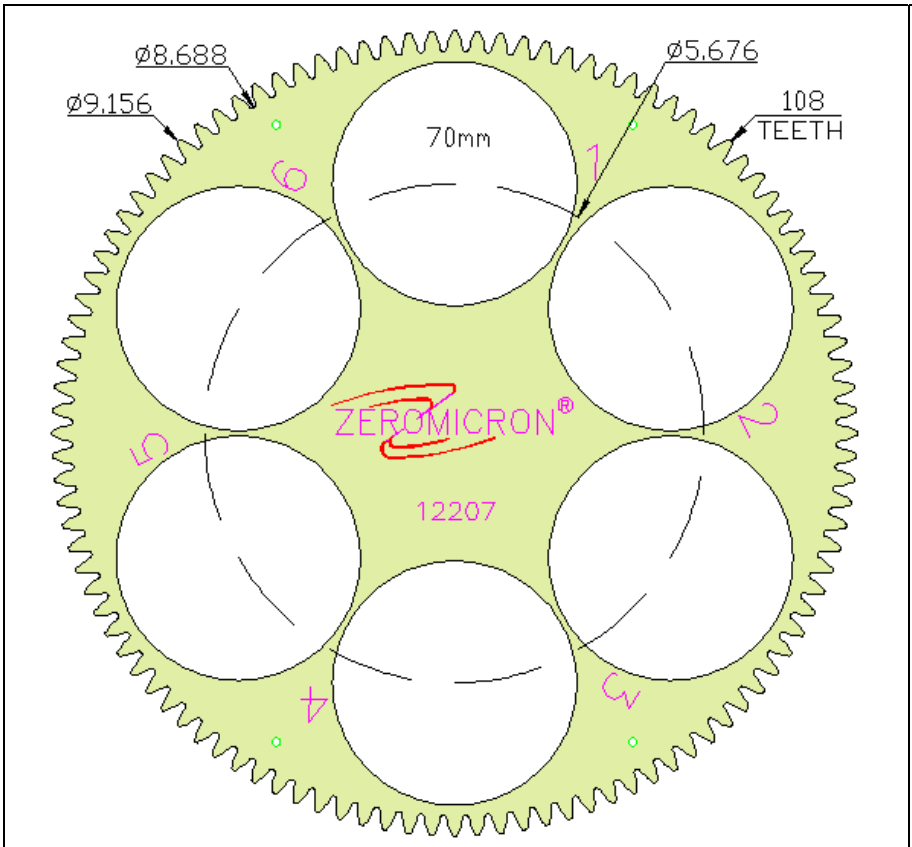
Tool:	This Gear Template was designed for use on a SpeedFam 9B tool. Every Gear Template is designed for a specific tool with defined gearing.
Work Piece size:	68.5 mm ("2.697 inch")* (pockets have engraved numbers)
Work Piece range:	68.0 mm to 70.0 mm* (customized to exact application specification)
Work Piece thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These gear templates can be configured to specified client requirements for OD, Root Diameter, number of teeth and work piece size.
Application:	See Tool above. This Geared Template is designed for polishing double side work pieces. The gears are cut to provide a 20° pressure angle with specific tooth parameters for the best smooth performance on the tool specified.

* Custom sizes, shapes, gears and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

GEAR TEMPLATE: 9.156" OD - 8.688" ROOT DIA. - 108 TEETH



OD = Outside Diameter of the Gear Teeth
= 9.156 inches

Root Diameter is the Diameter at the base of the Gear Teeth
= 8.688 inches

Number of Teeth = 108

Work Piece Size
= 70.0 mm

Number of Work Pieces
= 6

Standard construction
= G-10 laminate.
G-11 high temperature material available.

This Catalog Item defines the configuration and features of this Gear Template (#12207).
ZM part #'s are assigned to define the exact Gear Template with the required work piece size.

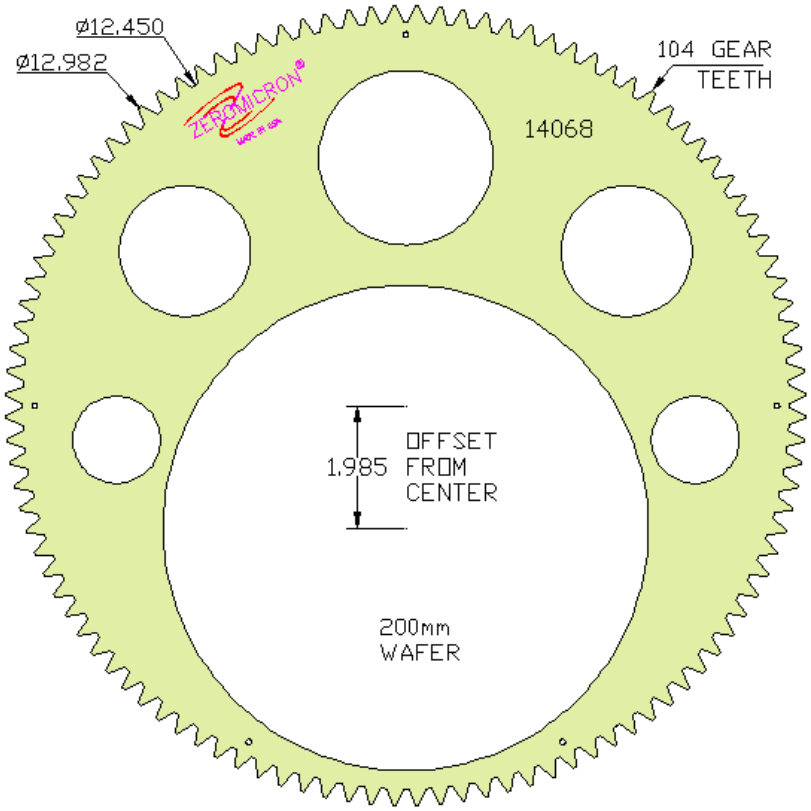
Tool:	This Gear Template was designed for use on a SpeedFam 9B tool. Every Gear Template is designed for a specific tool with defined gearing.
Work Piece size:	70.0 mm (2.756 inch)* (pockets have engraved numbers)
Work Piece range:	69.0 mm to 71.0 mm* (customized to exact application specification)
Work Piece thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These gear templates can be configured to specified client requirements for OD, Root Diameter, number of teeth and work piece size.
Application:	See Tool above. This Geared Template is designed for polishing double side work pieces. The gears are cut to provide a 20° pressure angle with specific tooth parameters for the best smooth performance on the tool specified.

* Custom sizes, shapes, gears and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

GEAR TEMPLATE: 12.982" OD - 12.450" ROOT DIA. - 104 TEETH



OD = Outside Diameter of the Gear Teeth
= 12.982 inches

Root Diameter is the Diameter at the base of the Gear Teeth
= 12.450 inches

Number of Teeth = 104

Work Piece Size
= 200 mm

Number of Work Pieces
= 1

Standard construction
= G-10 laminate.
G-11 high temperature material available.

This Catalog Item defines the configuration and features of this Gear Template (#14068).
ZM part #'s are assigned to define the exact Gear Template with the required work piece size.

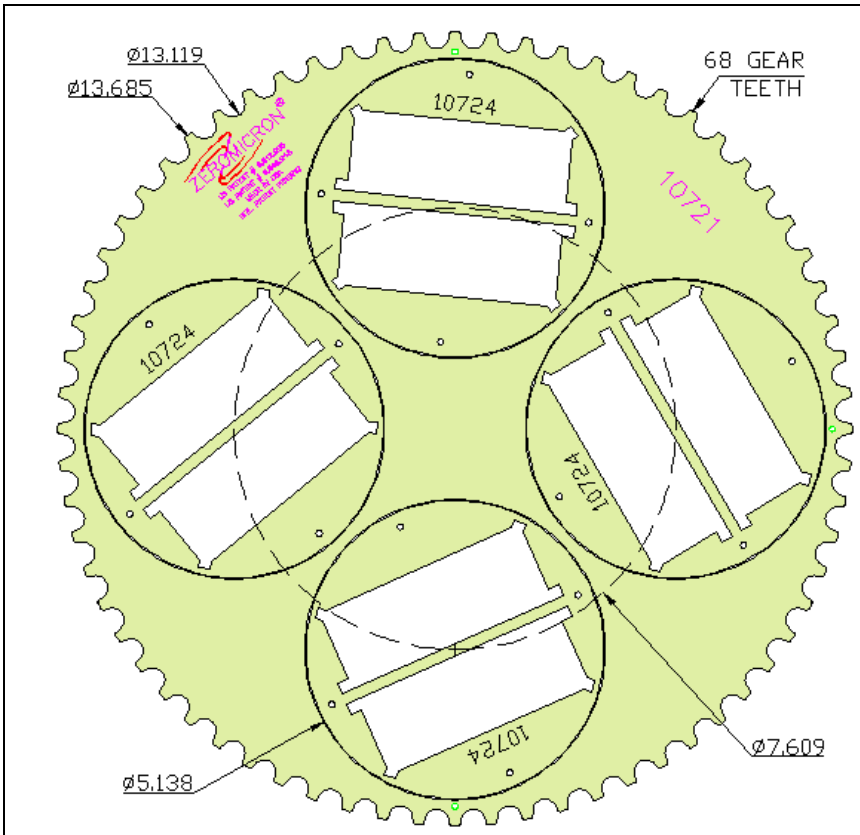
Tool:	This Gear Template was designed for use on a SpeedFam 13B9 tool. Every Gear Template is designed for a specific tool with defined gearing.
Work Piece size:	200 mm ("8 inch")*
Work Piece range:	200 mm to 202 mm* (customized to exact application specification)
Work Piece thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These gear templates can be configured to specified client requirements for OD, Root Diameter, number of teeth and work piece size.
Application:	See Tool above. This Geared Template is designed for polishing double side work pieces. The gears are cut to provide a 35° pressure angle with specific tooth parameters for the best smooth performance on the tool specified.

* Custom sizes, shapes, gears and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

GEAR TEMPLATE: 13.685” OD - 13.119" ROOT DIA. - 68 TEETH



OD = Outside Diameter of the Gear Teeth
= 13.685 inches

Root Diameter is the Diameter at the base of the Gear Teeth
= 13.119 inches

Number of Teeth = 68

Work Piece Size
= 131 mm

Number of Work Pieces
= 4

Standard construction
= G-10 laminate.
G-11 high temperature material available.

This Catalog Item defines the configuration and features of this Gear Template (#10721 w/ 4 X 10724). ZM part #’s are assigned to define the exact Gear Template with the required work piece size.

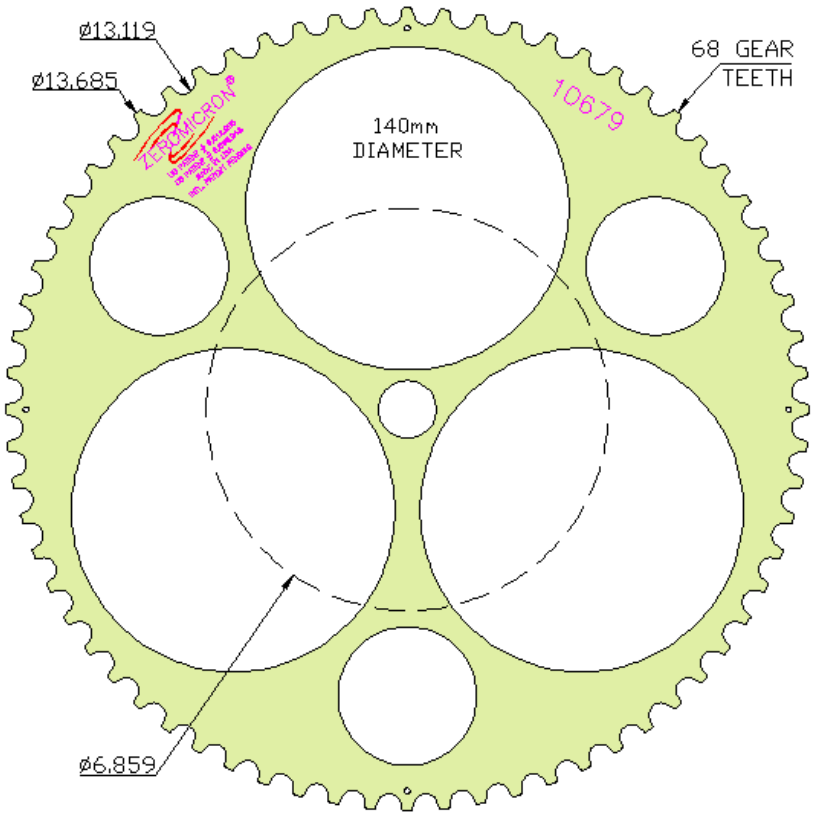
Tool:	This Gear Template was designed for use on a Peter Wolters AC1100 tool. Every Gear Template is designed for a specific tool with defined gearing.
Work Piece size:	131 mm custom spinning template inserts*
Work Piece range:	Customer defined* (Example shown is for custom Sapphire windows)
Work Piece thickness:	125um to greater than 35mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These gear templates can be configured to specified client requirements for OD, Root Diameter, number of teeth and work piece size.
Application:	See Tool above. This Geared Template is designed for polishing double side work pieces. The gears are cut to mate with a pin-drive system used on the above stated tool for the best smooth performance on the tool specified.

* Custom sizes, shapes, gears and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

GEAR TEMPLATE: 13.685” OD - 13.119" ROOT DIA. - 68 TEETH



OD = Outside Diameter of the Gear Teeth
= 13.685 inches

Root Diameter is the Diameter at the base of the Gear Teeth
= 13.119 inches

Number of Teeth = 68

Work Piece Size
= 140 mm

Number of Work Pieces
= 3

Standard construction
= G-10 laminate.
G-11 high temperature material available.

This Catalog Item defines the configuration and features of this Gear Template (#10679).
ZM part #’s are assigned to define the exact Gear Template with the required work piece size.

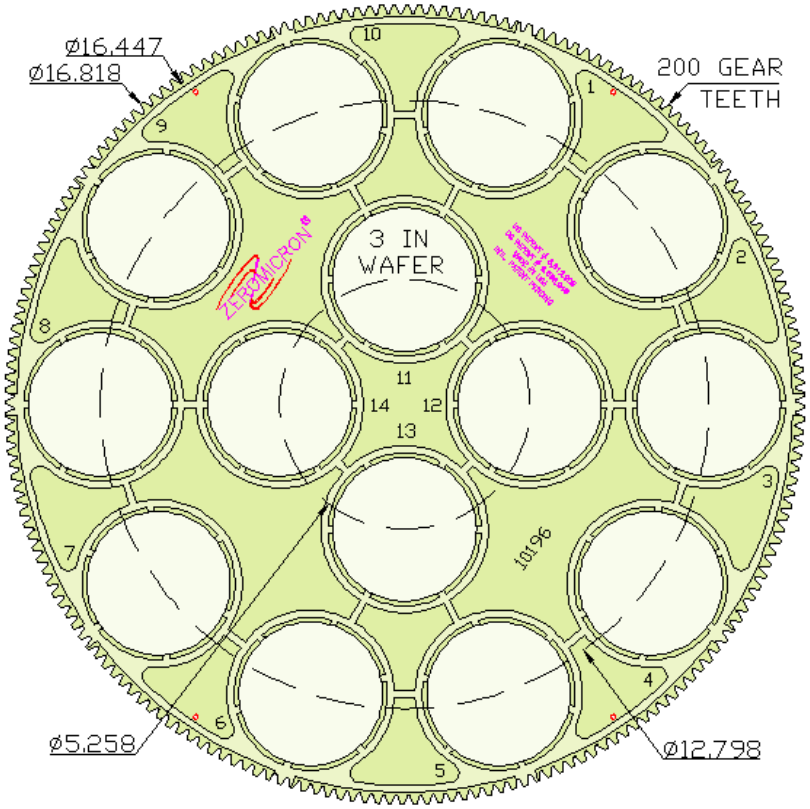
Tool:	This Gear Template was designed for use on a Peter Wolters AC1100 tool. Every Gear Template is designed for a specific tool with defined gearing.
Work Piece size:	140 mm (5.512 inches)*
Work Piece range:	138 mm to 142 mm* (Customized to exact user requirements)
Work Piece thickness:	125um to greater than 25 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These gear templates can be configured to specified client requirements for OD, Root Diameter, number of teeth and work piece size.
Application:	See Tool above. This Geared Template is designed for polishing double side work pieces. The gears are cut to mate with a pin-drive system used on the above stated tool for the best smooth performance on the tool specified.

* Custom sizes, shapes, gears and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

GEAR TEMPLATE: 16.818" OD - 16.447" ROOT DIA. - 200 TEETH



OD = Outside Diameter of the Gear Teeth
= 16.818 inches

Root Diameter is the Diameter at the base of the Gear Teeth
= 16.447 inches

Number of Teeth = 200

Work Piece Size
= 76.2mm

Number of Work Pieces
= 14

Standard construction
= G-10 laminate.
G-11 high temperature material available.

This Catalog Item defines the configuration and features of this Gear Template (#12206).
ZM part #'s are assigned to define the exact Gear Template with the required work piece size.

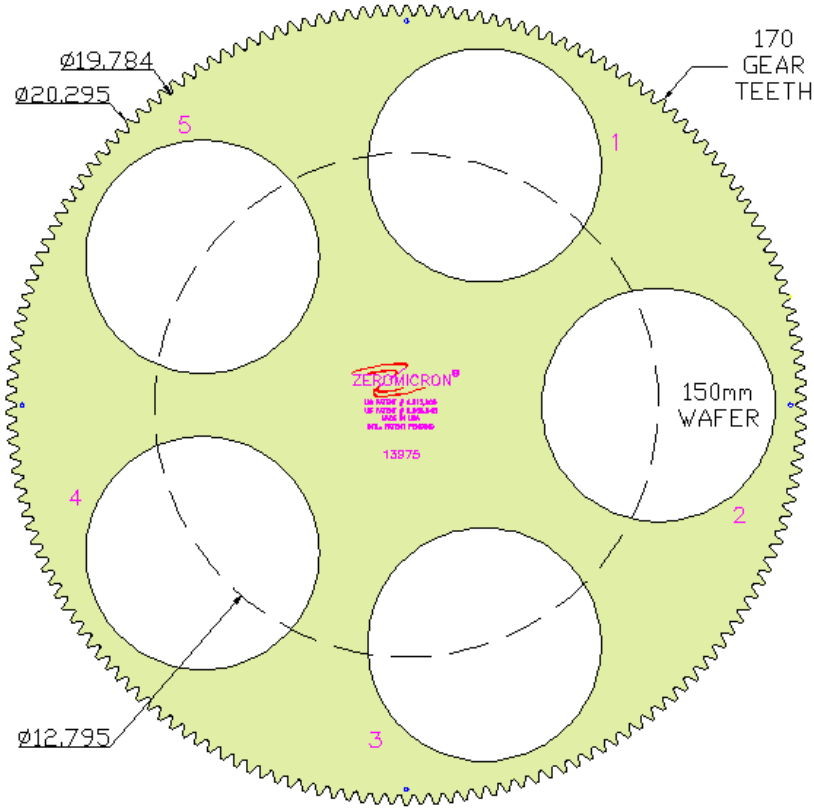
Tool:	This Gear Template was designed for use on a SpeedFam 16B5 tool. Every Gear Template is designed for a specific tool with defined gearing.
Work Piece size:	76.2 mm (3.00 inch)* (pockets have engraved numbers)
Work Piece range:	76.2 mm to 78.0 mm* (customized to exact application specification)
Work Piece thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order. This version uses the ZM patented CIG.
	These gear templates can be configured to specified client requirements for OD, Root Diameter, number of teeth and work piece size.
Application:	See Tool above. This Geared Template is designed for polishing single side work pieces. The gears are cut to provide a 20° pressure angle with specific tooth parameters for the best smooth performance on the tool specified.

* Custom sizes, shapes, gears and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

GEAR TEMPLATE: 20.295" OD - 19.784" ROOT DIA. - 170 TEETH



OD = Outside Diameter of the Gear Teeth
= 20.295 inches

Root Diameter is the Diameter at the base of the Gear Teeth
= 19.784 inches

Number of Teeth = 170

Work Piece Size
= 150 mm

Number of Work Pieces
= 5

Standard construction
= G-10 laminate.
G-11 high temperature material available.

This Catalog Item defines the configuration and features of this Gear Template (#13975).
ZM part #'s are assigned to define the exact Gear Template with the required work piece size.

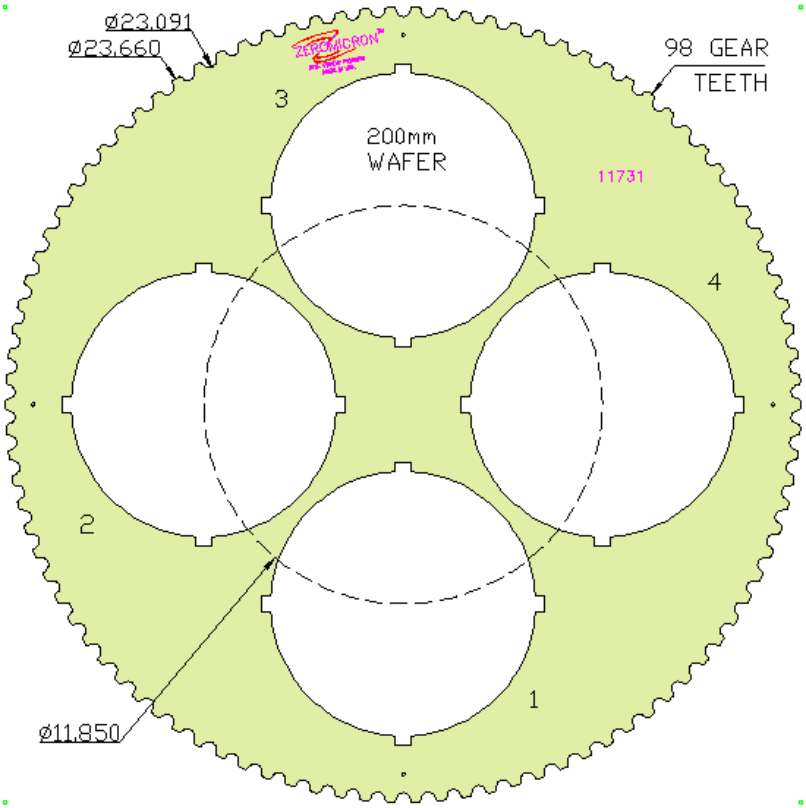
Tool:	This Gear Template was designed for use on a SpeedFam 20B4 tool. Every Gear Template is designed for a specific tool with defined gearing.
Work Piece size:	150.5 mm (5.925 inch)* (pockets have engraved numbers)
Work Piece range:	150.0 mm to 152.0 mm* (customized to exact application specification)
Work Piece thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These gear templates can be configured to specified client requirements for OD, Root Diameter, number of teeth and work piece size.
Application:	See Tool above. This Geared Template is designed for polishing double side work pieces. The gears are cut to provide a 20° pressure angle with specific tooth parameters for the best smooth performance on the tool specified.

* Custom sizes, shapes, gears and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

GEAR TEMPLATE: 23.660” OD - 23.091" ROOT DIA. - 100 TEETH



OD = Outside Diameter of the Gear Teeth
= 23.660 inches

Root Diameter is the Diameter at the base of the Gear Teeth
= 23.091 inches

Number of Teeth = 100

Work Piece Size
= 200 mm

Number of Work Pieces
= 4

Standard construction
= G-10 laminate.
G-11 high temperature material available.

This Catalog Item defines the configuration and features of this Gear Template (#11731).
ZM part #’s are assigned to define the exact Gear Template with the required work piece size.

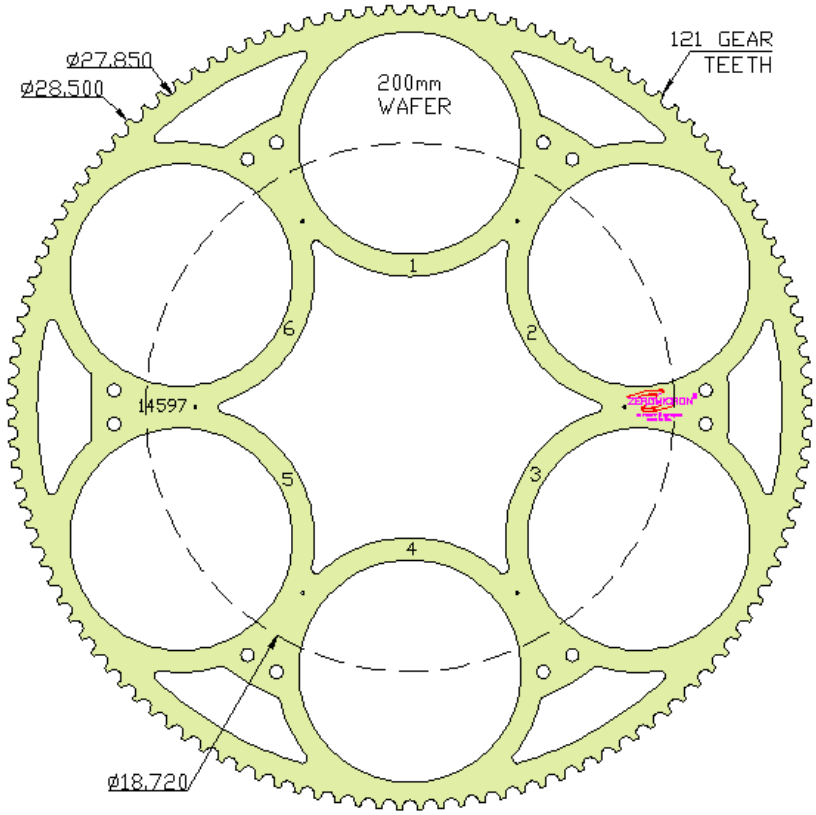
Tool:	This Gear Template was designed for use on a Peter Wolters AC150 tool. Every Gear Template is designed for a specific tool with defined gearing.
Work Piece size:	200 mm (“8 inches”)*
Work Piece range:	200 mm to 202 mm* (Customized to exact user requirements)
Work Piece thickness:	125um to greater than 25 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These gear templates can be configured to specified client requirements for OD, Root Diameter, number of teeth and work piece size.
Application:	See Tool above. This Geared Template is designed for polishing double side work pieces. The gears are cut to mate with a pin-drive system used on the above stated tool for the best smooth performance on the tool specified.

* Custom sizes, shapes, gears and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

GEAR TEMPLATE: 28.500” OD - 27.850" ROOT DIA. - 121 TEETH



OD = Outside Diameter of the Gear Teeth
= 28.500 inches

Root Diameter is the Diameter at the base of the Gear Teeth
= 27.850 inches

Number of Teeth = 121

Work Piece Size
= 200 mm

Number of Work Pieces
= 6

Standard construction
= G-10 laminate.
G-11 high temperature material available.

This Catalog Item defines the configuration and features of this Gear Template (#14597).
ZM part #’s are assigned to define the exact Gear Template with the required work piece size.

Tool:	This Gear Template was designed for use on a Peter Wolters 2000 tool. Every Gear Template is designed for a specific tool with defined gearing.
Work Piece size:	200 mm (“8 inches”)*
Work Piece range:	200 mm to 202 mm* (Customized to exact user requirements)
Work Piece thickness:	125um to greater than 25 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These gear templates can be configured to specified client requirements for OD, Root Diameter, number of teeth and work piece size.
Application:	See Tool above. This Geared Template is designed for polishing double side work pieces. The gears are cut to mate with a pin-drive system used on the above stated tool for the best smooth performance on the tool specified.

* Custom sizes, shapes, gears and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

Pad Dressers

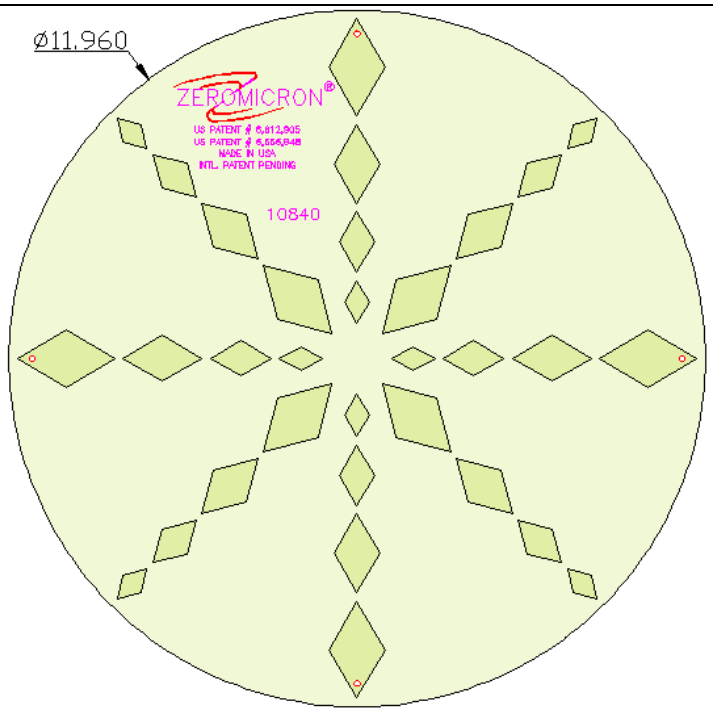
ZeroMicron pad dressers come in two basic types, a pad dresser for rough polish and a pad dresser for final polish.

Rough polish polishing pads are typically very hard with an open cell structure to accommodate fast material removal. These pads typically require the standard 3M puck with diamonds bonded to the surface.

Final polishing pads are a softer construction and do not require the expensive diamond pucks and can be conditioned with a G-10 or G11 diamond patterned template. ZeroMicron has designed final stage polishing pad dressers where material is removed from the surface to create sharp edged raised diamond patterns that renew the pad surface.

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PAD DRESSER: 11.960" DIAMETER - DIAMOND PATTERN



This Pad Dresser has a dual pattern of diamond shapes milled out of a solid piece of rugged G-10 material.

The diamond patterns are reversed to insure 100% surface coverage and are milled with sharp edges to cut into the pad surface to reopen the pad cellular surface structure.

This Pad Dresser is 11.96 inches in diameter. Other standard sizes are available and custom sixes can be provided.

This Catalog Item defines the configuration and features of this Pad Dressers (# 10840).

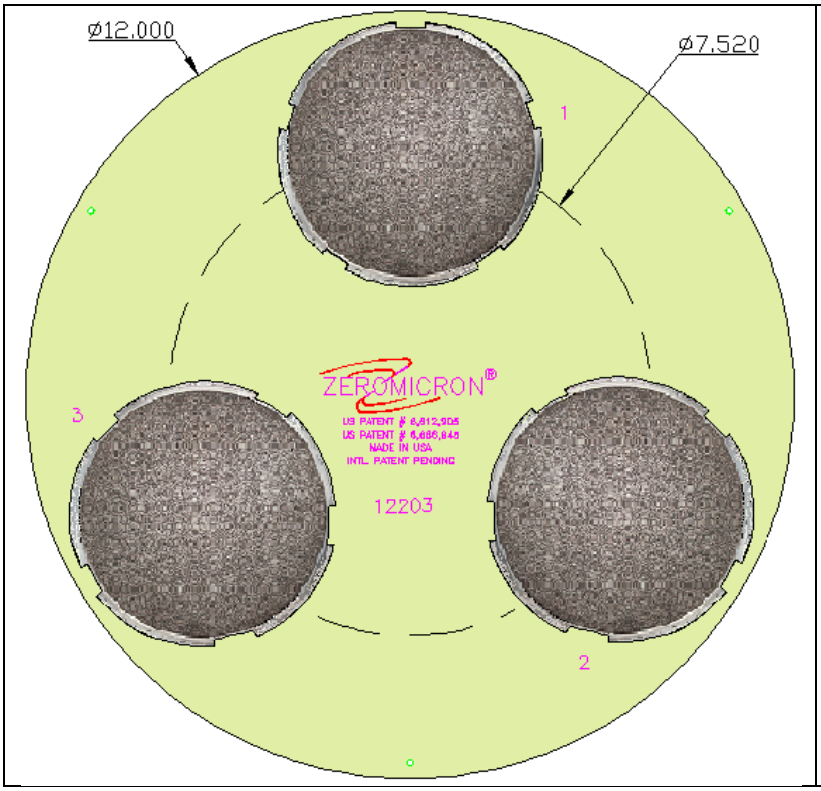
Polish head size:	11.960 inch (304 mm)*
Material thickness:	G-10 material 0.093 inches thick.* Material is milled away to a 0.047 inch thickness leaving the exposed diamond pattern raised 0.047 inches above the plane of the Pad Dresser.
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	This Pad Dresser is milled from a solid piece and therefore cannot separate under normal usage.
Application:	As polishing pads are worn they accumulate material in the open cell structure of the pad. They also abrade the cells and can, under higher temperatures create a “glazing” effect causing the surface cells to close and become ineffective for polishing. This Pad Dresser cuts into the pad surface and open this cell structure to create a like new surface for polishing and saving the expensive pad and the down time of removing and replacing the polishing pad. Care should be take when using the Pad Dresser to fully clean the pad surface to remove loose material.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PAD DRESSER: 12.000" DIAMETER - 3 POCKET - 4" DIAMOND PUCKS



This Pad Dresser is a multipart assembly that uses a ZeroMicron patented PadSert assembly mounted under the 3M puck style pad dresser to assure that the puck will rotate freely.

The pucks are modified so that they can be retained by the upper G-10 plate.

This style of Pad Dresser is available in all standard polishing head sizes and custom sizes can be provided on request.

This Catalog Item defines the configuration and features of this Pad Dresser (# 12203 & # 12204)

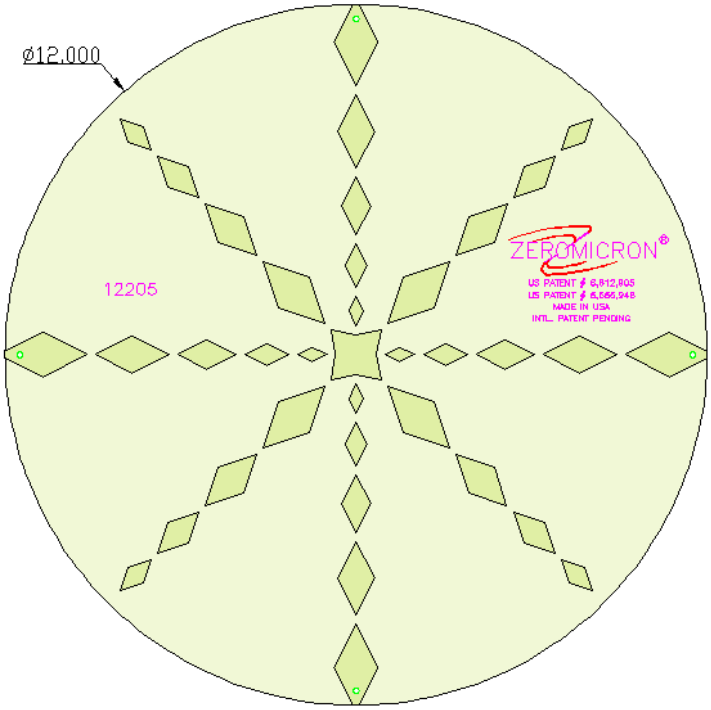
Polish head size:	12.000 inch (305 mm)*
Material:	This assembly is comprised of a bottom layer that holds the diamond pucks with an upper retainer. The pucks sit on an assembly that is based on the ZeroMicron patented S3 technology that assures their longevity.
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	Three of the 3M pad dressers are used in this assembly.
Application:	As polishing pads are worn they accumulate material in the open cell structure of the pad. They also abrade the cells and can, under higher temperatures create a "glazing" effect causing the surface cells to close and become ineffective. This Pad Dresser cuts into the pad surface and open this cell structure to create a like new surface for polishing and saving the expensive pad and the down time of removing and replacing the polishing pad. Care should be take when using the Pad Dressers to fully clean the pad surface to remove loose material.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PAD DRESSER: 12.000" DIAMETER - DIAMOND PATTERN



This Pad Dresser has a dual pattern of diamond shapes milled out of a solid piece of rugged G-10 material.

The diamond patterns are reversed to insure 100% surface coverage and are milled with sharp edges to cut into the pad surface to reopen the pad cellular surface structure.

This Pad Dresser is 12.00 inches in diameter. Other standard sizes are available and custom sixes can be provided.

This Catalog Item defines the configuration and features of this Pad Dressers (# 12205).

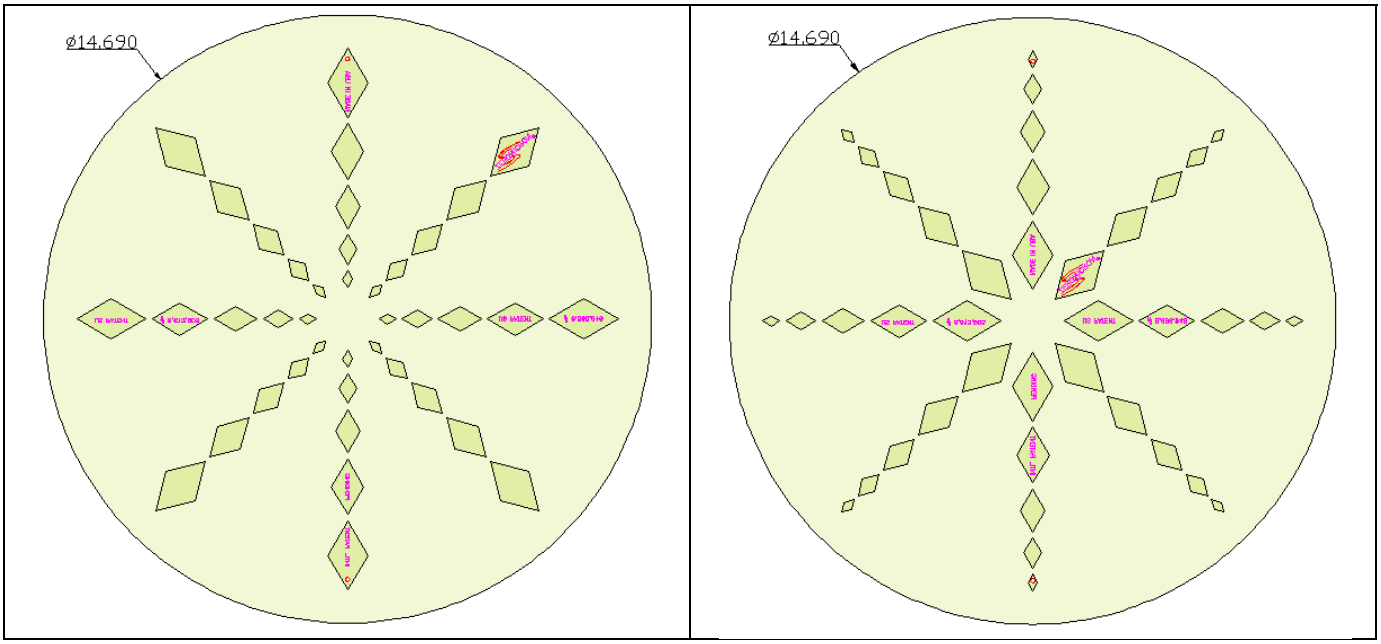
Polish head size:	12.000 inch (305 mm)*
Material thickness:	G-10 material 0.093 inches thick.* Material is milled away to a half material thickness leaving the exposed diamond pattern raised above the plane of the Pad Dresser.
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	This Pad Dresser is milled from a solid piece and therefore cannot separate under normal usage.
Application:	As polishing pads are worn they accumulate material in the open cell structure of the pad. They also abrade the cells and can, under higher temperatures create a “glazing” effect causing the surface cells to close and become ineffective for polishing. This Pad Dresser cuts into the pad surface and open this cell structure to create a like new surface for polishing and saving the expensive pad and the down time of removing and replacing the polishing pad. Care should be take when using the Pad Dresser to fully clean the pad surface to remove loose material.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PAD DRESSER: 14.690" DIAMETER - DIAMOND PATTERN



This Catalog Item defines the configuration and features of these Pad Dressers (# 10283 and # 10284).

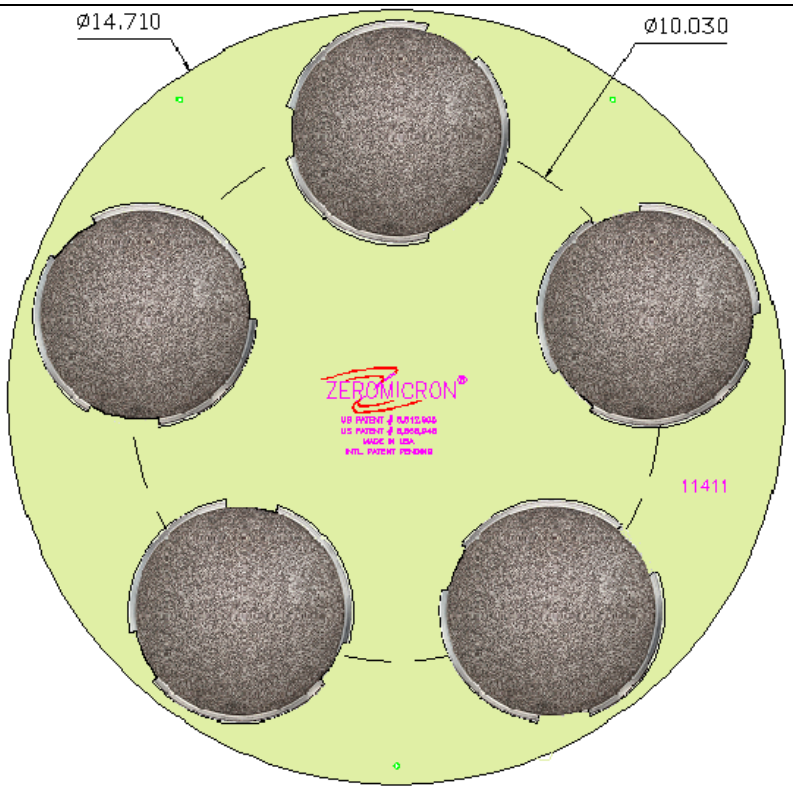
Polish head size:	14.690 inch (373 mm)*
Material thickness:	G-10 material 0.062 inches thick.* Material is milled away to a 0.031 inch thickness leaving the exposed diamond pattern raised 0.031 inches above the plane of the Pad Dresser.
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These Pad Dressers are milled from a solid piece and therefore cannot separate under normal usage.
	Sold individually or in sets, they are designed to be run in a pair, one after the other. Order is not important.
Application:	As polishing pads are worn they accumulate material in the open cell structure of the pad. They also abrade the cells and can, under higher temperatures create a “glazing” effect causing the surface cells to close and become ineffective for polishing. These Pad Dressers cut into the pad surface and open this cell structure to create a like new surface for polishing and saving the expensive pad and the down time of removing and replacing the polishing pad. Care should be take when using the Pad Dressers to fully clean the pad surface to remove loose material.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PAD DRESSER: 14.710" DIAMETER - 5 POCKET - 4" DIAMOND PUCKS



This Pad Dresser is a multipart assembly that uses a ZeroMicron patented PadSert assembly mounted under the 3M puck style pad dresser to assure that the puck will rotate freely.

The pucks are modified so that they can be retained by the upper G-10 plate.

This style of Pad Dresser is available in all standard polishing head sizes and custom sizes can be provided on request.

This Catalog Item defines the configuration and features of this Pad Dresser (# 11411).

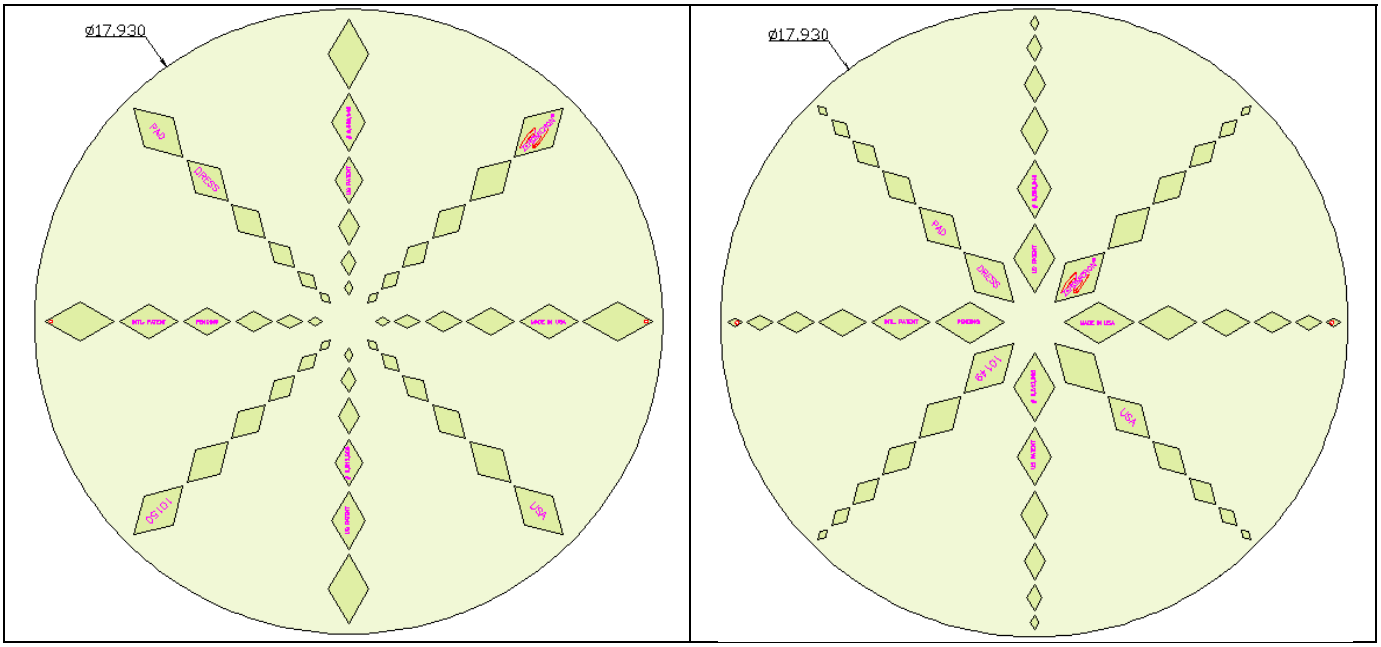
Polish head size:	14.710 inch (374 mm)*
Material:	This assembly is comprised of a bottom layer that holds the diamond pucks with an upper retainer. The pucks sit on an assembly that is based on the ZeroMicron patented S3 technology that assures their longevity.
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	Five of the 3M pad dressers are used in this assembly.
Application:	As polishing pads are worn they accumulate material in the open cell structure of the pad. They also abrade the cells and can, under higher temperatures create a "glazing" effect causing the surface cells to close and become ineffective. This Pad Dresser cuts into the pad surface and open this cell structure to create a like new surface for polishing and saving the expensive pad and the down time of removing and replacing the polishing pad. Care should be take when using the Pad Dressers to fully clean the pad surface to remove loose material.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PAD DRESSER: 17.930" DIAMETER – DIAMOND PATTERN



This Catalog Item defines the configuration and features of these Pad Dressers (# 10149 and # 10150).

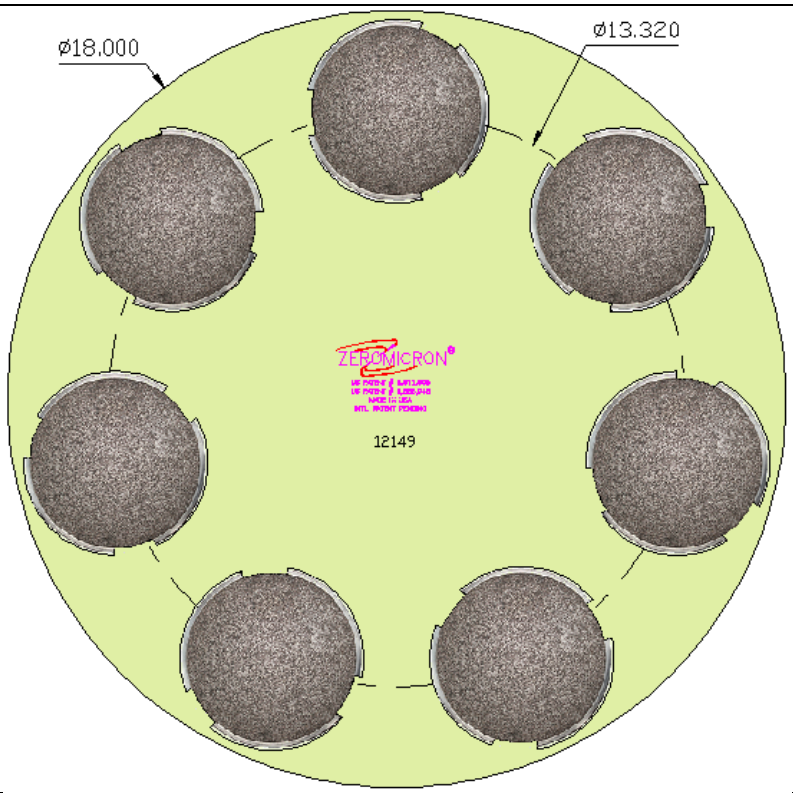
Polish head size:	17.930 inch (455 mm)*
Material thickness:	G-10 material 0.062 inches thick.* Material is milled away to a 0.031 inch thickness leaving the exposed diamond pattern raised 0.031 inches above the plane of the Pad Dresser.
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These Pad Dressers are milled from a solid piece and therefore cannot separate under normal usage.
	Sold individually or in sets, they are designed to be run in a pair, one after the other. Order is not important.
Application:	As polishing pads are worn they accumulate material in the open cell structure of the pad. They also abrade the cells and can, under higher temperatures create a “glazing” effect causing the surface cells to close and become ineffective for polishing. These Pad Dressers cut into the pad surface and open this cell structure to create a like new surface for polishing and saving the expensive pad and the down time of removing and replacing the polishing pad. Care should be take when using the Pad Dressers to fully clean the pad surface to remove loose material.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PAD DRESSER: 18.000" DIAMETER - 7 POCKET - 4" DIAMOND PUCKS



This Pad Dresser is a multipart assembly that uses a ZeroMicron patented PadSert assembly mounted under the 3M puck style pad dresser to assure that the puck will rotate freely.

The pucks are modified so that they can be retained by the upper G-10 plate.

This style of Pad Dresser is available in all standard polishing head sizes and custom sizes can be provided on request.

This Catalog Item defines the configuration and features of these Pad Dressers (# 12149).

Polish head size:	18.000 inch (457 mm)*
Material :	This assembly is comprised of a bottom layer that holds the diamond pucks with an upper retainer. The pucks sit on an assembly that is based on the ZeroMicron patented S3 technology that assures their longevity.
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	Seven of the 3M pad dressers are used in this assembly.
Application:	As polishing pads are worn they accumulate material in the open cell structure of the pad. They also abrade the cells and can, under higher temperatures create a “glazing” effect causing the surface cells to close and become ineffective. This Pad Dresser cuts into the pad surface and open this cell structure to create a like new surface for polishing and saving the expensive pad and the down time of removing and replacing the polishing pad. Care should be take when using the Pad Dressers to fully clean the pad surface to remove loose material.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

Polishing Templates

Polishing templates are available for all of the SEMI standard wafer sizes as well as any user specified special size or shape.

Templates are separated into two categories, by wafer size and by polishing head diameter.

ZeroMicron templates actually fall into three categories based on the materials they are designed to process. Soft materials like germanium require a special construction to insure proper performance and long service life. Both soft materials and medium hardness materials like quartz, glass and silicon with process times of less than 30 minutes can use the very popular Shim Spinning System (S^3) technology.

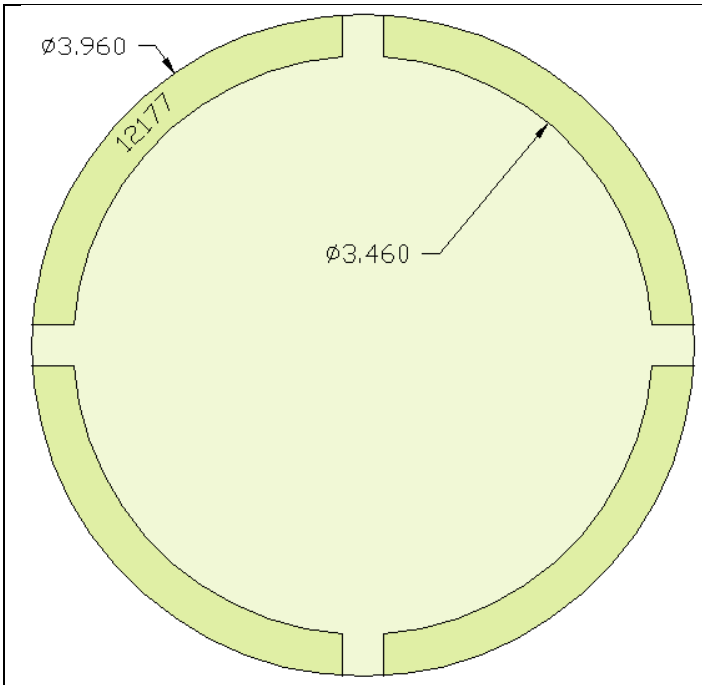
Hard materials such as sapphire and silicon carbide use a different construction and are recommended for use with PadSerts or PadPockets. These designs allow the work-piece to rotate for extended periods longer than 30 minutes.

All three of these products can be supplied with or without Chemical Introducing Grooves (CIG). This patented feature routes the slurry to the wafer to put more slurry directly onto the wafer during polishing.

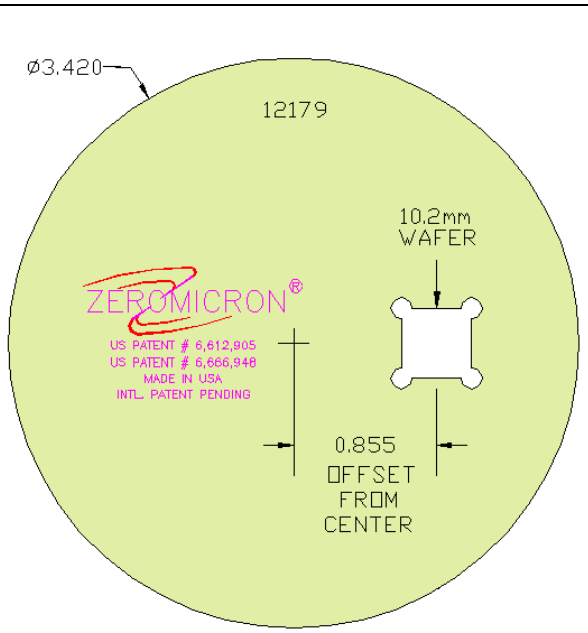
A fourth type of template is the classical template with the poromeric material mounted in the bottom of the wafer pocket. This is a basic template with the exception that it is constructed with the same rugged design for long service life.

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

SPINNING TEMPLATE: 3.960" DIA. HOLDER, 3.42” DIA. TEMPLATE FOR 10.2mm SQUARE – 1 POCKET OFFSET FROM CENTER



Template Holder (P/N ST-001)



Spinning Template (P/N ST-003)

This Catalog Item defines the configuration and features of this Spinning Template ST-003.

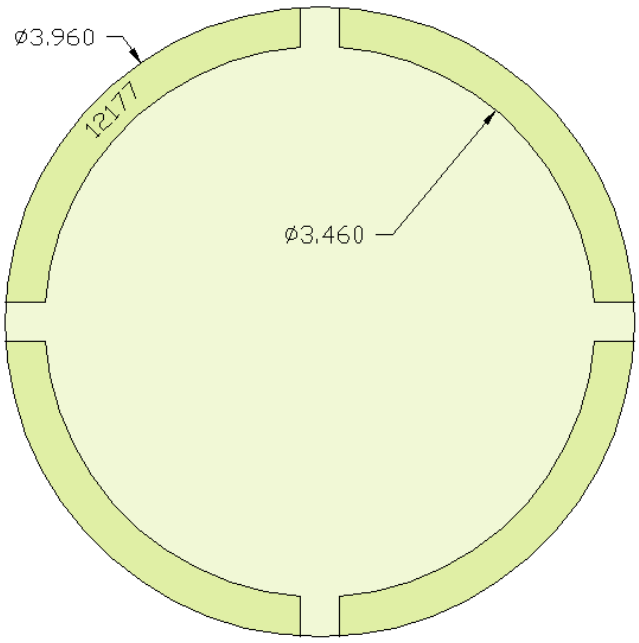
Polish head size:	3.960 inch (100.6 mm)*
Wafer size:	10.2 mm (“0.40 inch”)* Square workpiece
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this format allow the wafer to rotate in the holder as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This Template Holder and Spinning Template are designed to allow the holder to be mounted to the polishing head and the Spinning Template to be interchanged with other Spinning Templates of the same diameter. The Spinning Template uses a poromeric material to hold the workpiece and shim inserts to adjust the exposure of the workpiece for proper polishing

* Custom sizes, shapes and thickness capabilities are available on request.

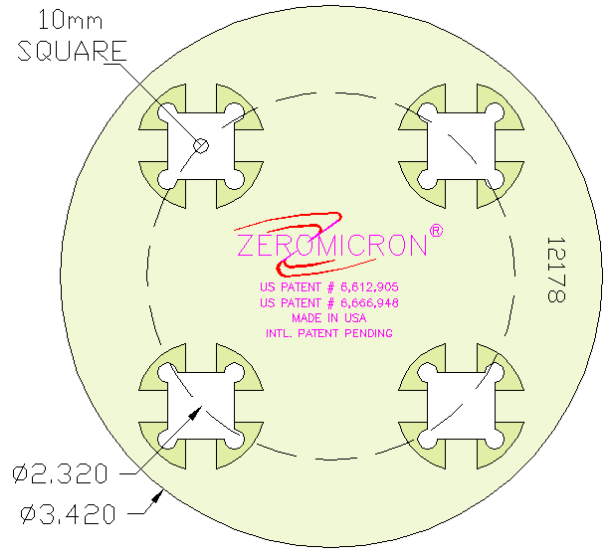
Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

SPINNING TEMPLATE: 3.960" DIA. HOLDER, 3.42” DIA. TEMPLATE FOR 10.2mm SQUARE – 4 POCKET W/ CIG



Template Holder (P/N ST-001)



Spinning Template (P/N ST-002)

This Catalog Item defines the configuration and features of this Spinning Template ST-002.

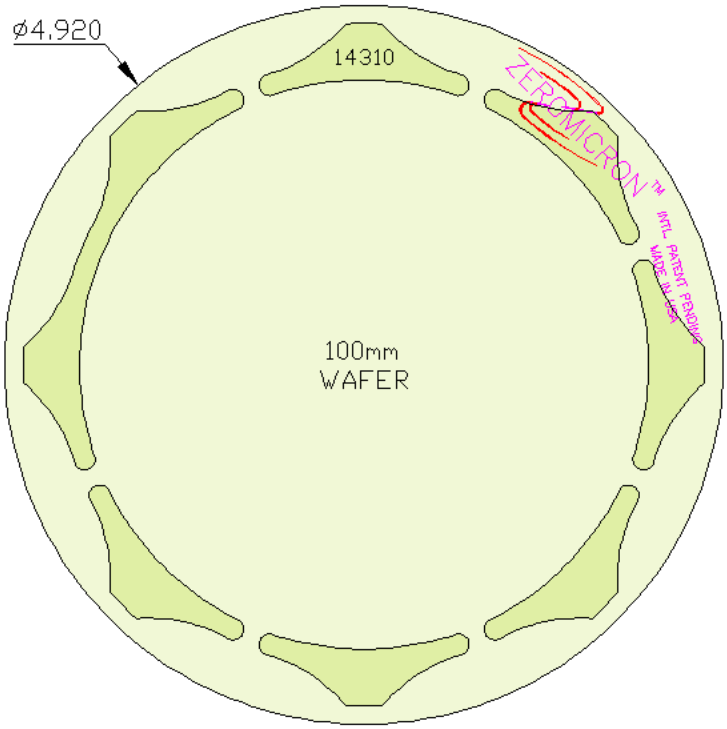
Polish head size:	3.960 inch (100.6 mm)*
Wafer size:	10.2 mm (“0.40 inch”)* Square workpieces (4 Each)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	This template design uses the ZM patented CIG (Chemical Introducing Groove) technology to provide better slurry application to the workpiece.
	All templates in this format allow the wafer to rotate in the holder as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This Template Holder and Spinning Template are designed to allow the holder to be mounted to the polishing head and the Spinning Template to be interchanged with other Spinning Templates of the same diameter. The Spinning Template uses a poromeric material to hold the workpiece and shim inserts to adjust the exposure of the workpiece for proper polishing.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 4.920" DIA. – 100mm WAFER – 1 MILLED POCKET – W/ CIG



Diameter = 4.920 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame (#14310).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

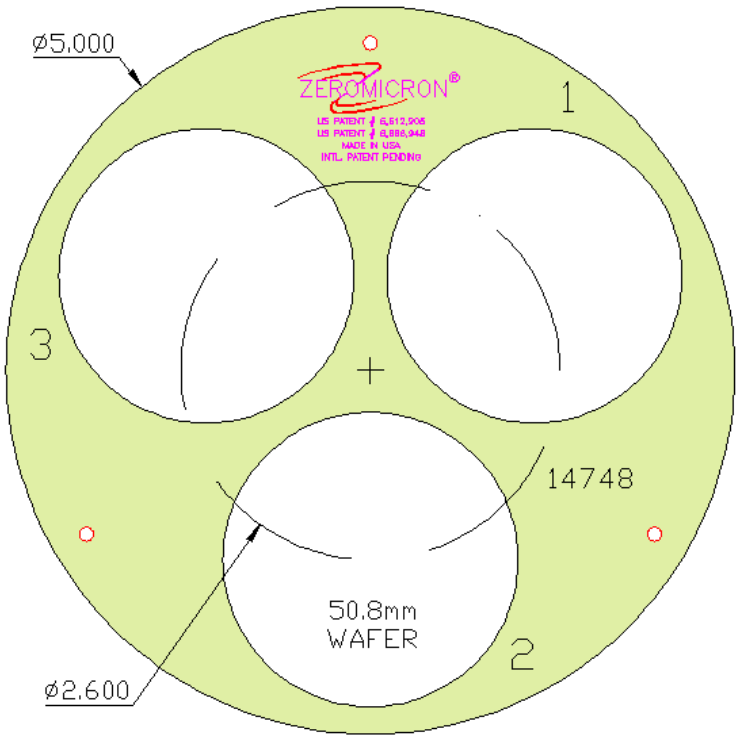
Polish head size:	4.920 inch (125 mm)*
Wafer size:	100 mm ("4 inch")*
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 5.000" DIA. – 50.8mm WAFER – 3 POCKETS



Diameter = 5.000 inches

Wafer Size = 50.8mm
(2 inch)

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#14748).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

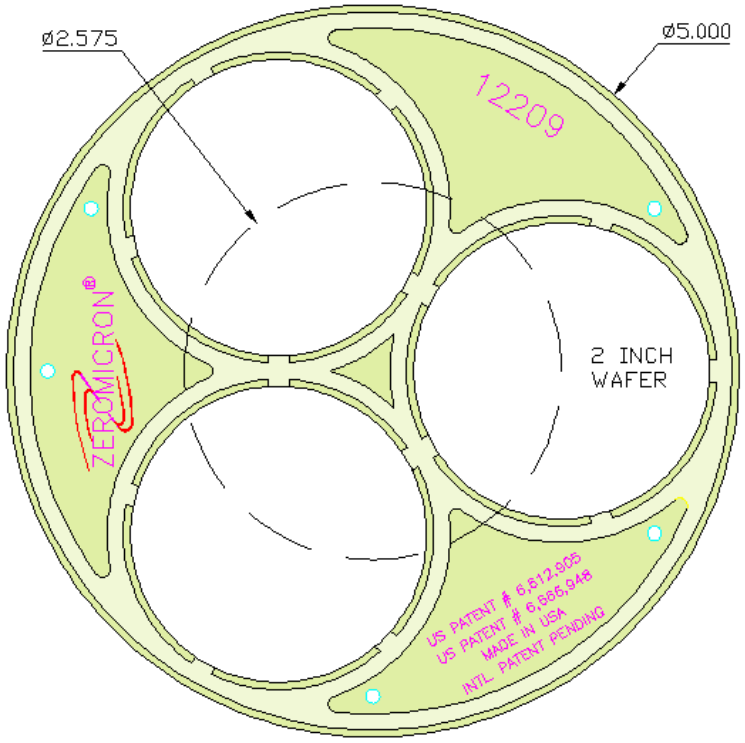
Polish head size:	5.000 inch (127 mm)*
Wafer size:	50.8 mm (2 inch)* (pockets have engraved numbers)
Wafer pocket range:	51.0 mm to 52.0 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 5.000" DIA. – 2 INCH WAFER – 3 POCKETS – W/ CIG



Diameter = 5.000 inches

Wafer Size = 50.8 mm
(2 inch)

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 12209)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

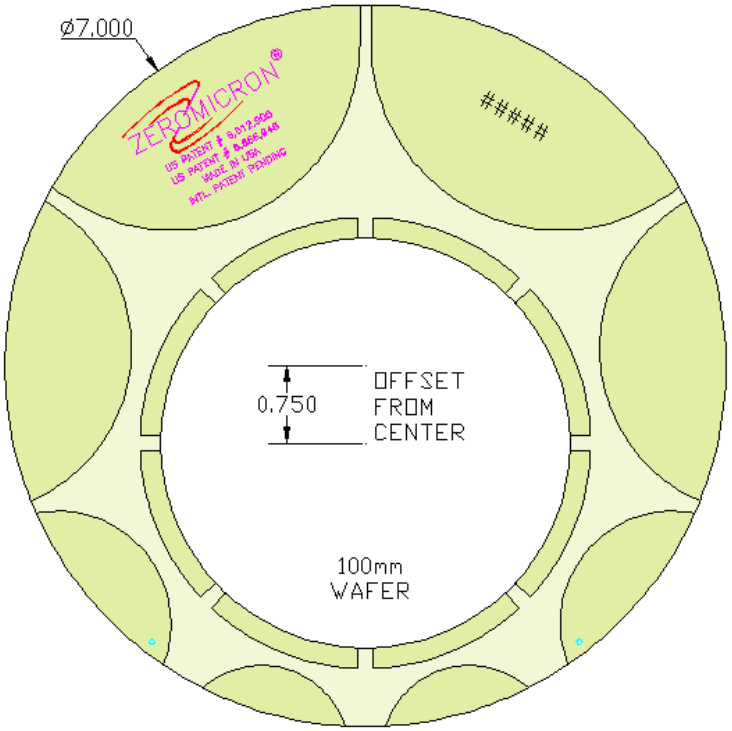
Polish head size:	5.000 inch (xxx mm)*
Wafer size:	50.80 mm (2 inch)* (pockets have engraved numbers)
Wafer pocket range:	50.80 mm to 51.90 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 7.000" DIA. – 100mm WAFER – 1 POCKET – W/ CIG



Diameter = 7.000 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# TBD)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

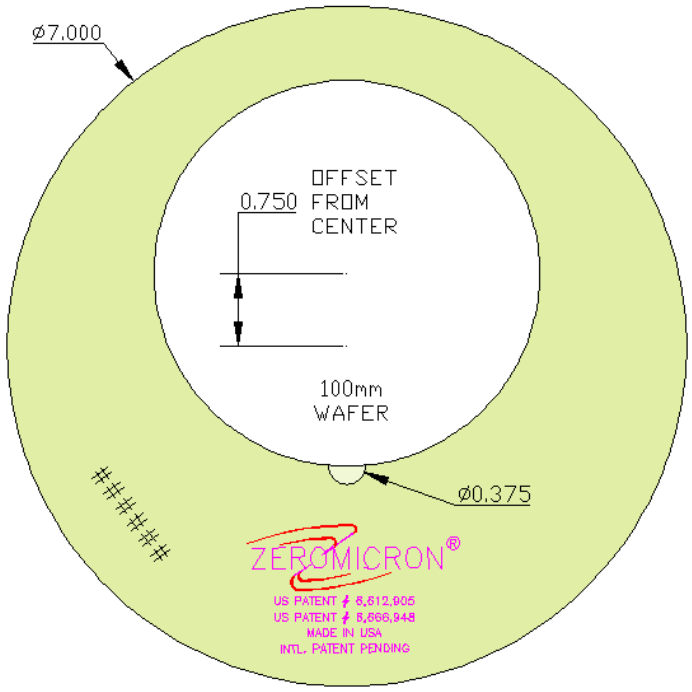
Polish head size:	7.000 inch (178 mm)*
Wafer size:	100 mm ("4 inch")*
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 7.000" DIA. – 100mm WAFER – 1 POCKET – NOTCHED



Diameter = 7.000 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

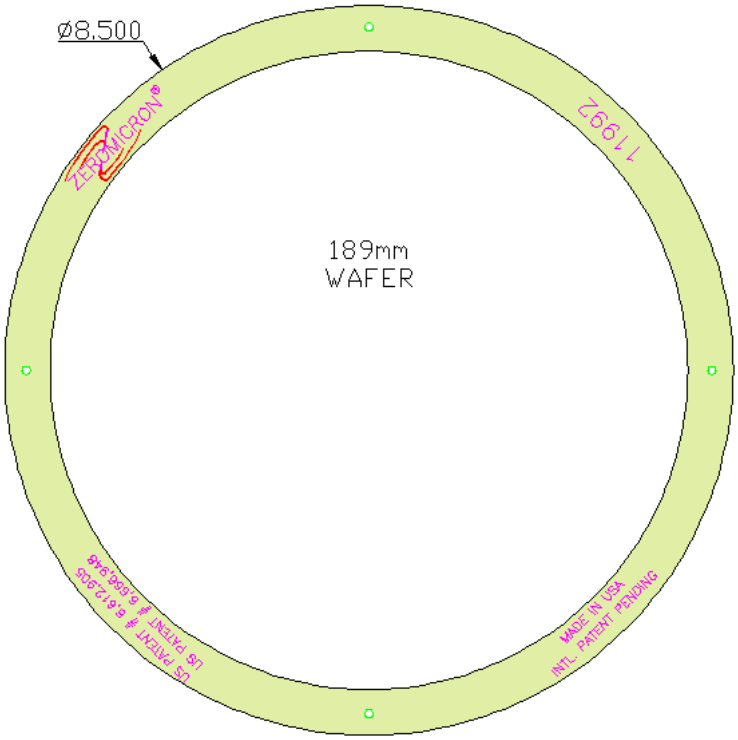
Polish head size:	7.000 inch (178 mm)*
Wafer size:	100 mm ("4 inch")*
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 8.500" DIA. – 189mm WAFER – 1 POCKET



Diameter = 8.500 inches

Wafer Size = 189mm
("7.44 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#11992).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

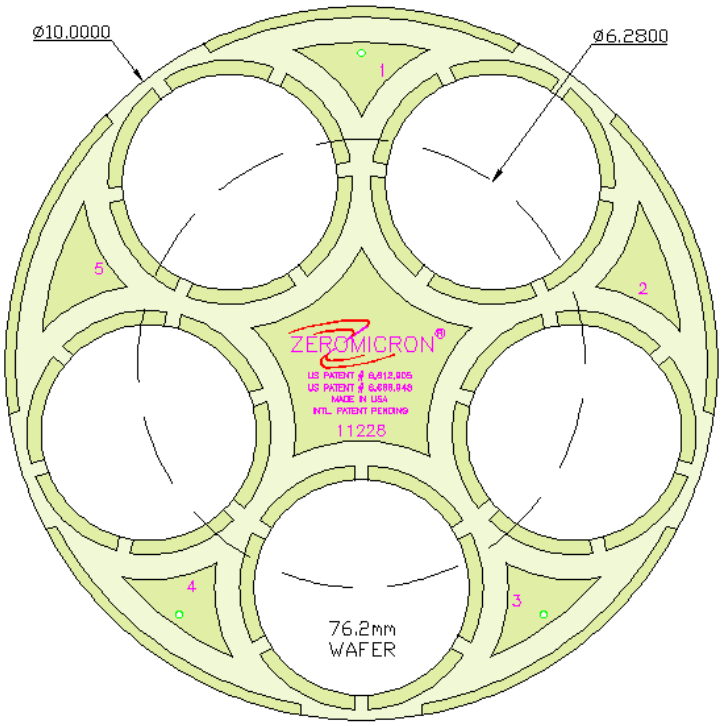
Polish head size:	8.500 inch (216 mm)*
Wafer size:	189 mm ("7.44 inch")*
Wafer pocket range:	189.0 mm to 190.0 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 10.000" DIA. – 76.2mm WAFER – 5 POCKETS – W/ CIG



Diameter = 10.000 inches

Wafer Size = 76.2mm
(3 inch)

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame (#11228).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

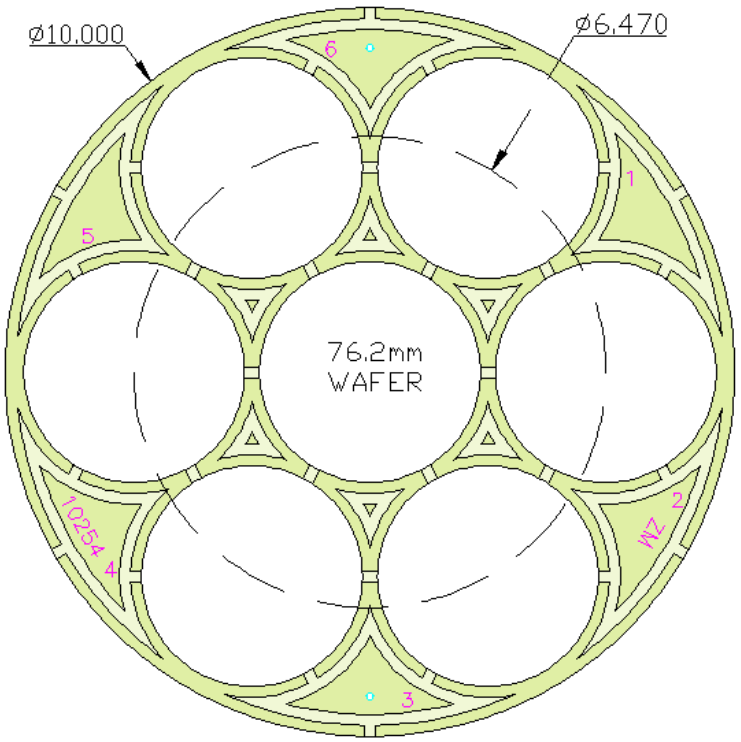
Polish head size:	10.000 inch (254 mm)*
Wafer size:	76.2 mm (3 inch)* (pockets have engraved numbers)
Wafer pocket range:	76.4 mm to 77.4 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 10.000" DIA. – 76.2mm WAFER – 7 POCKETS – W/ CIG



Diameter = 10.000 inches

Wafer Size = 76.2 mm
(3 inch)

Number of Pockets = 7

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 10254)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

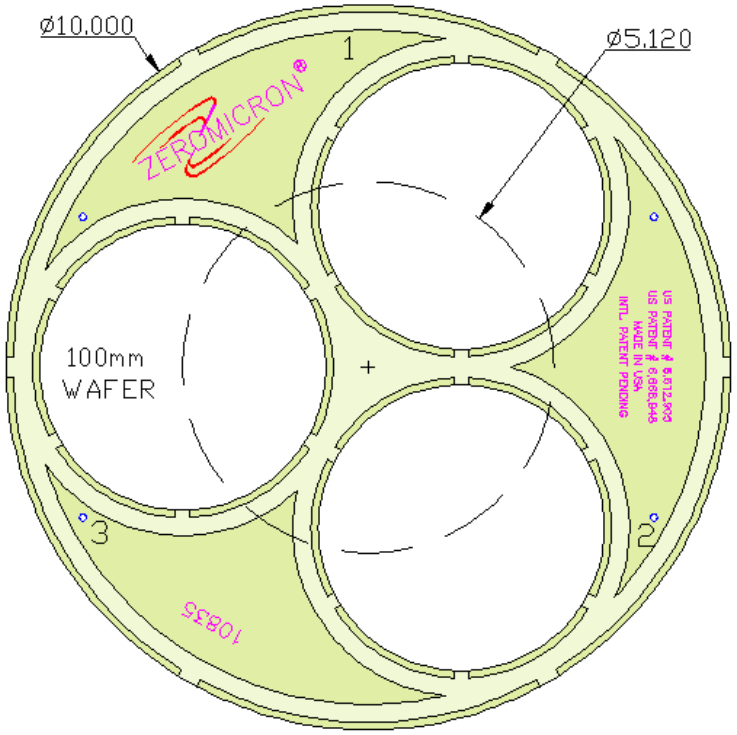
Polish head size:	10.000 inch (254 mm)*
Wafer size:	76.2 mm (3 inch)* (pockets have engraved numbers)
Wafer pocket range:	76.2 mm to 77.3 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 10.000" DIA. – 100mm WAFER – 3 POCKETS – W/ CIG



Diameter = 10.000 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 10835)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

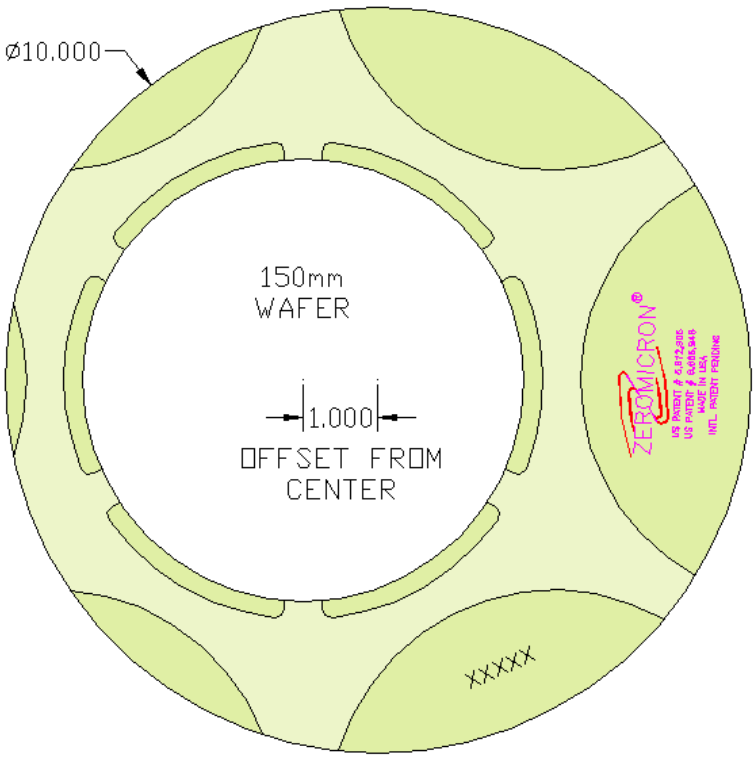
Polish head size:	10.000 inch (254 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 10.000" DIA. – 150mm WAFER – 1 POCKET – W/ CIG



Diameter = 10.000 inches

Wafer Size = 150 mm
("6 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# TBD)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

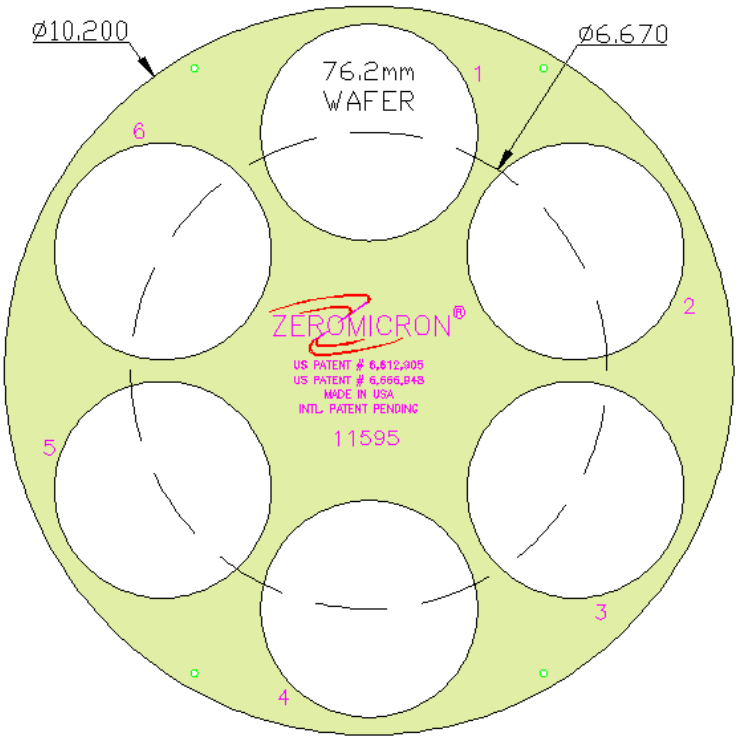
Polish head size:	10.000 inch (254 mm)*
Wafer size:	150 mm ("6 inch")*
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 10.200" DIA. – 76.2mm WAFER – 6 POCKETS



Diameter = 10.200 inches

Wafer Size = 76.2mm
(3 inch)

Number of Pockets = 6

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#11595).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

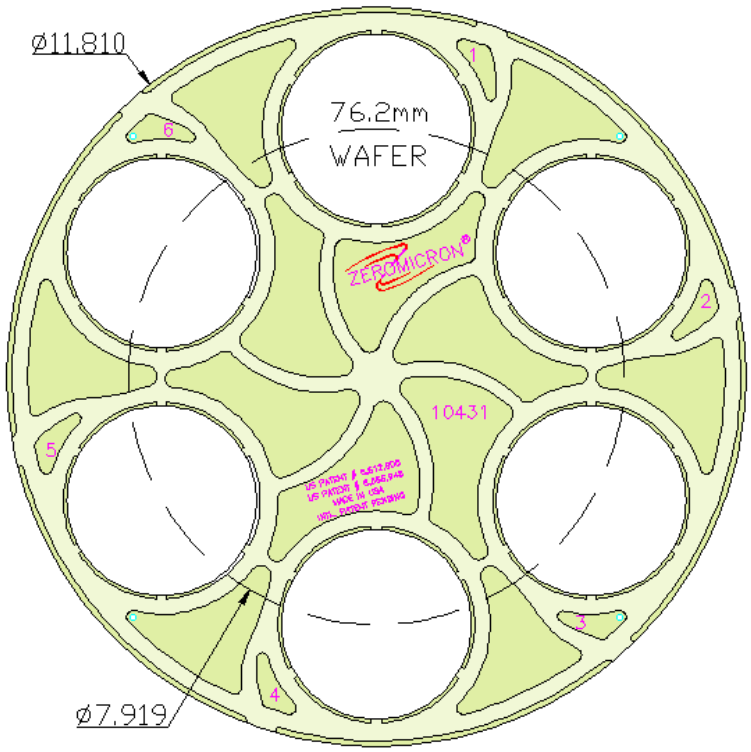
Polish head size:	10.200 inch (259 mm)*
Wafer size:	76.2 mm (3 inch)* (pockets have engraved numbers)
Wafer pocket range:	76.2 mm to 77.3 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 11.810" DIA. – 76.2mm WAFER – 6 POCKETS – W/ CIG



Diameter = 11.810 inches

Wafer Size = 76.2 mm
(3 inch)

Number of Pockets = 6

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 10431)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

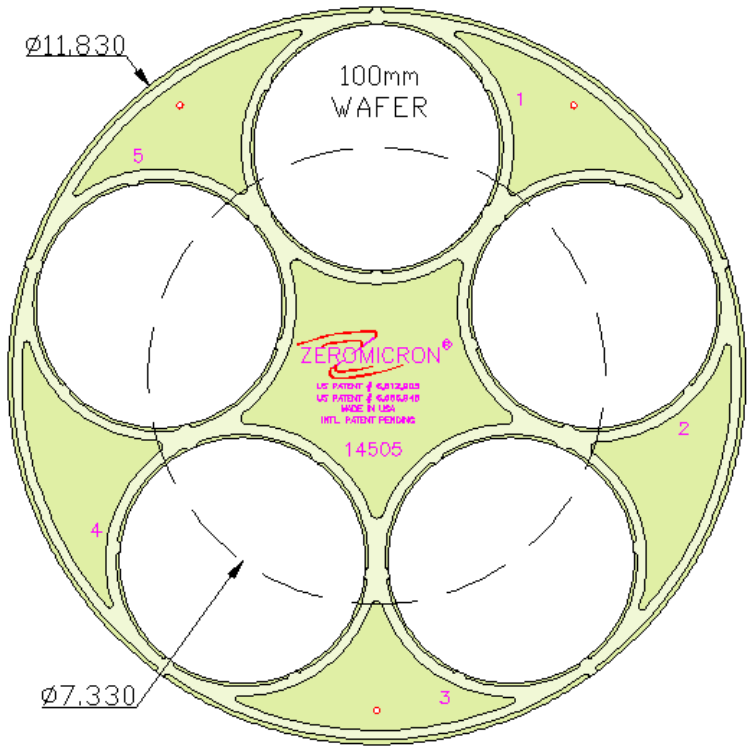
Polish head size:	11.810 inch (300 mm)*
Wafer size:	76.2 mm (3 inch)* (pockets have engraved numbers)
Wafer pocket range:	76.2 mm to 77.3 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 11.830" DIA. – 100mm WAFER – 5 POCKETS – W/ CIG



Diameter = 11.830 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# xxxxx)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

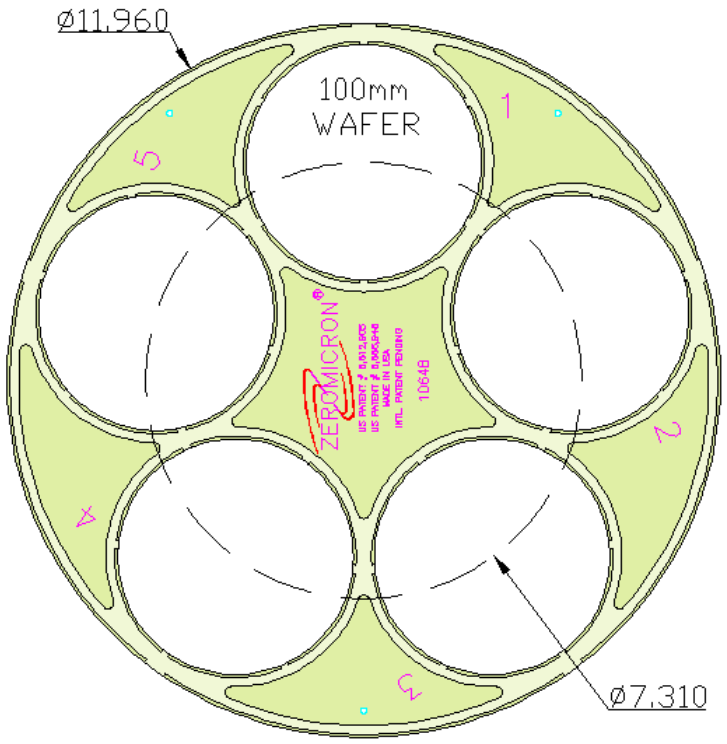
Polish head size:	11.830 inch (300 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100 mm to 101.1 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 11.960" DIA. – 100mm WAFER – 5 POCKETS – W/ CIG



Diameter = 11.960 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 10648)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

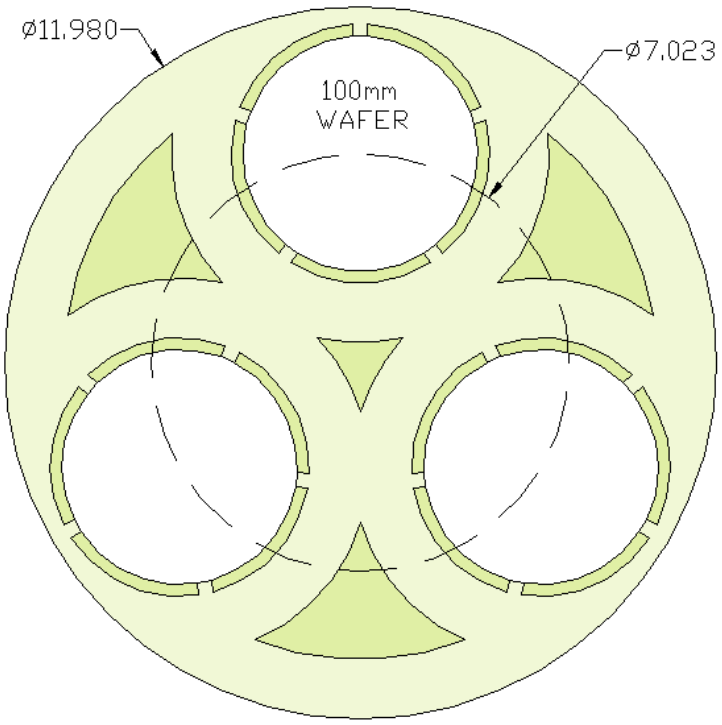
Polish head size:	11.960 inch (304 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 11.980" DIA. – 100mm WAFER – 3 POCKETS – W/ CIG



Diameter = 11.980 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# TBD)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

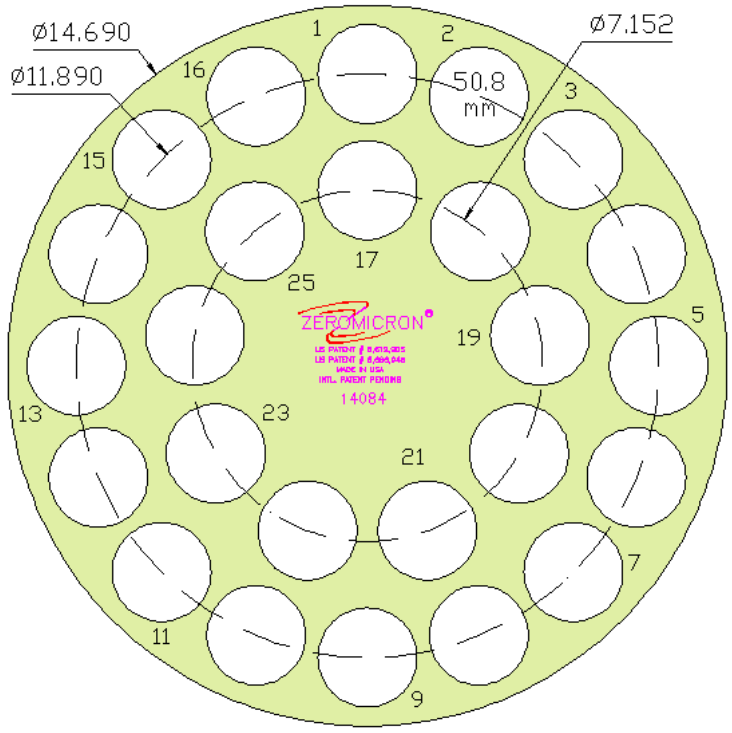
Polish head size:	11.980 inch (304 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 50.8mm WAFER – 25 POCKETS



Diameter = 14.690 inches

Wafer Size = 50.8mm
(2 inch)

Number of Pockets = 25

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#14084).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

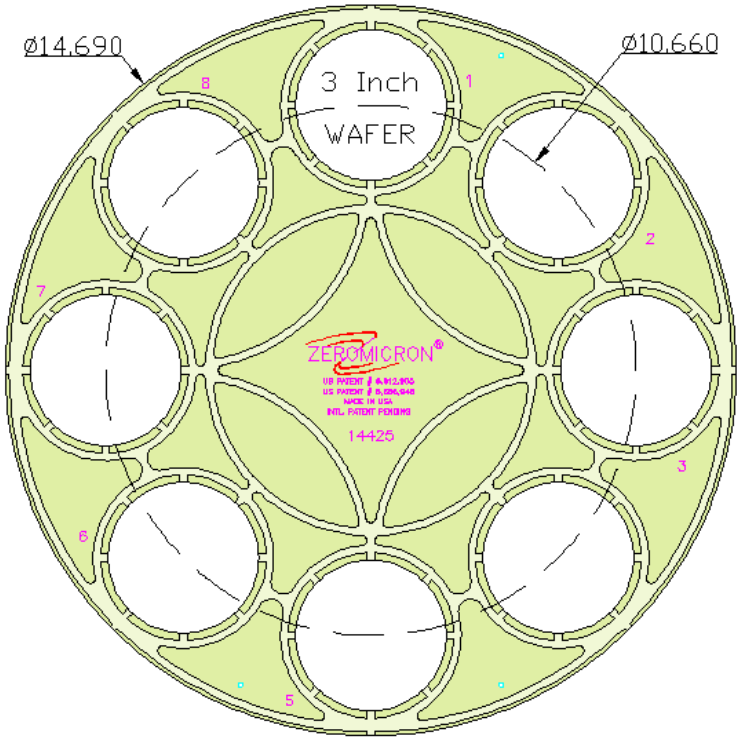
Polish head size:	14.690 inch (373 mm)*
Wafer size:	50.8 mm (2 inch)* (pockets have engraved numbers)
Wafer pocket range:	51.0 mm to 52.0 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 76.2mm WAFER – 8 POCKETS – W/ CIG



Diameter = 14.690 inches

Wafer Size = 76.2 mm
(3 inch)

Number of Pockets = 8

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 14425)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

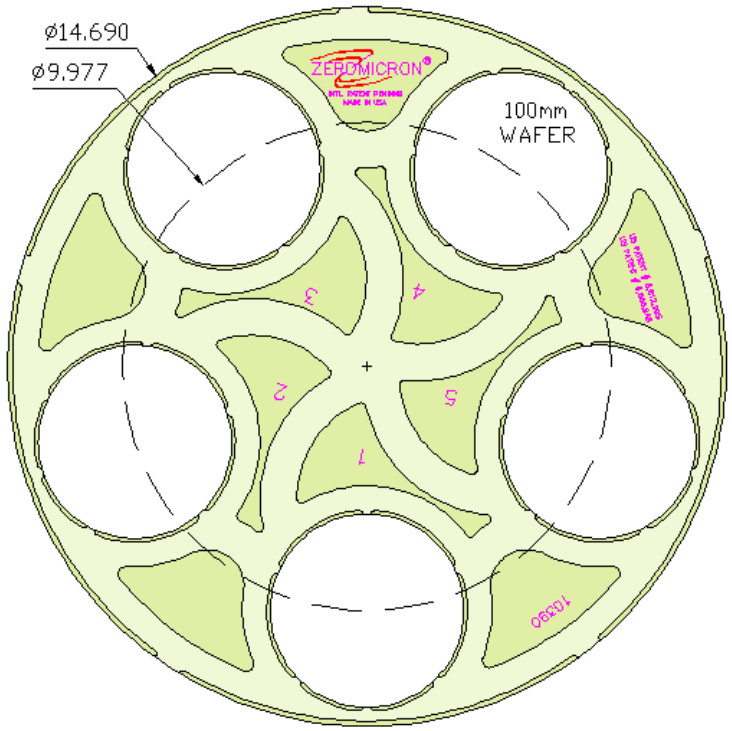
Polish head size:	14.690 inch (373 mm)*
Wafer size:	76.2 mm (3 inch)* (pockets have engraved numbers)
Wafer pocket range:	76.2 mm to 77.3 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 100mm WAFER – 5 POCKETS – W/ CIG



Diameter = 14.690 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (#10390)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

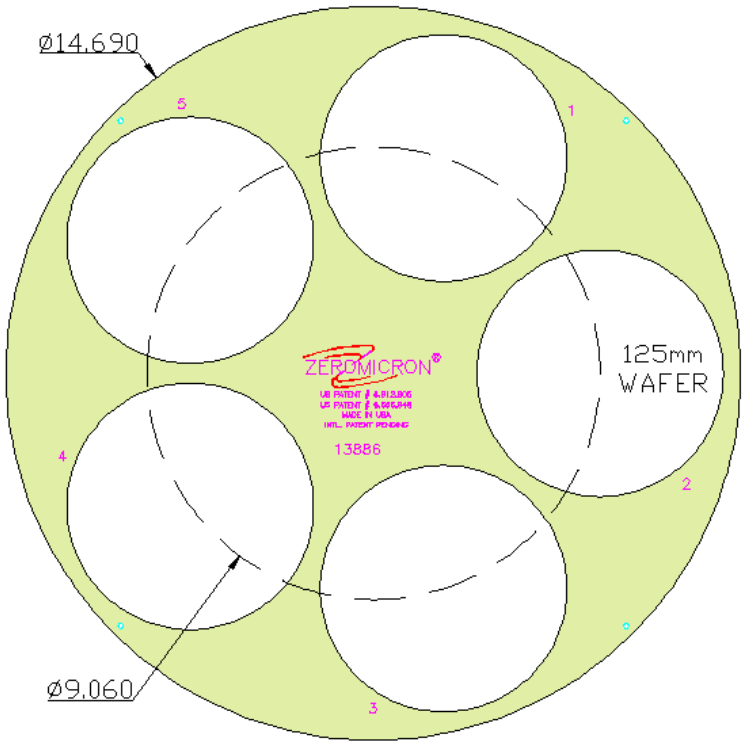
Polish head size:	14.690 inch (373 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 125mm WAFER – 5 POCKETS



Diameter = 14.690 inches

Wafer Size = 125mm
("5 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#13886).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

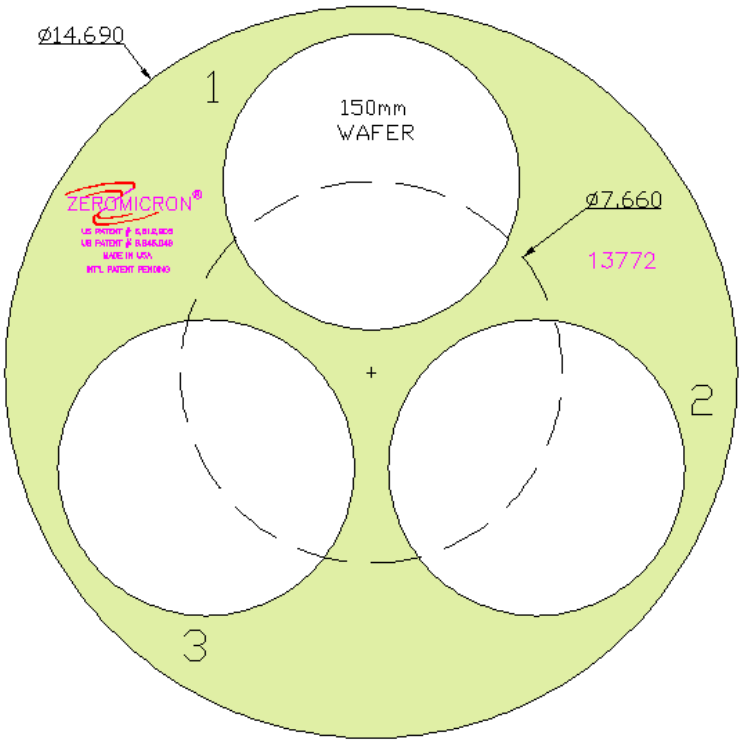
Polish head size:	14.690 inch (373 mm)*
Wafer size:	125 mm ("5 inch")* (pockets have engraved numbers)
Wafer pocket range:	125.0 mm to 126.1 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 150mm WAFER – 3 POCKETS



Diameter = 14.690 inches

Wafer Size = 150mm
("6 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#13772).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

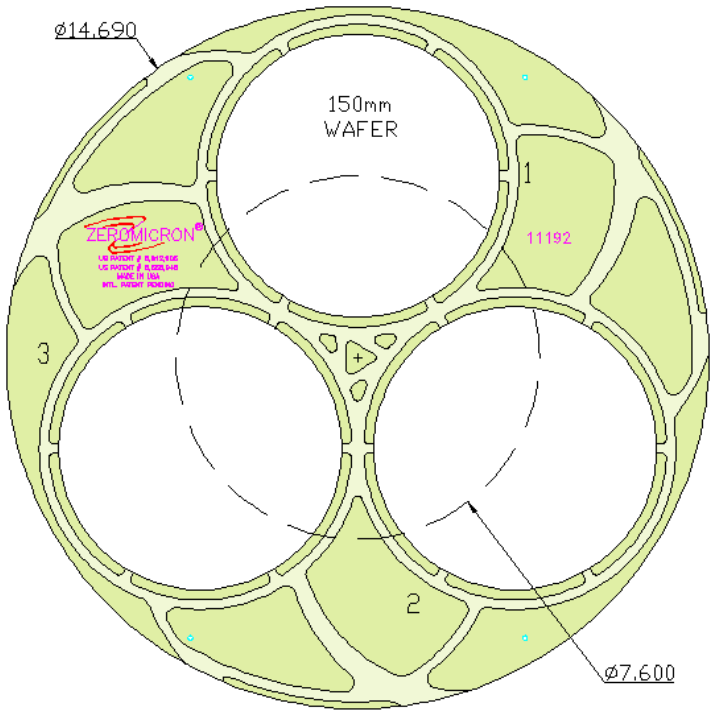
Polish head size:	14.690 inch (373 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 150mm WAFER – 3 POCKETS – W/ CIG



Diameter = 14.690 inches

Wafer Size = 150 mm
("6 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 11192)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

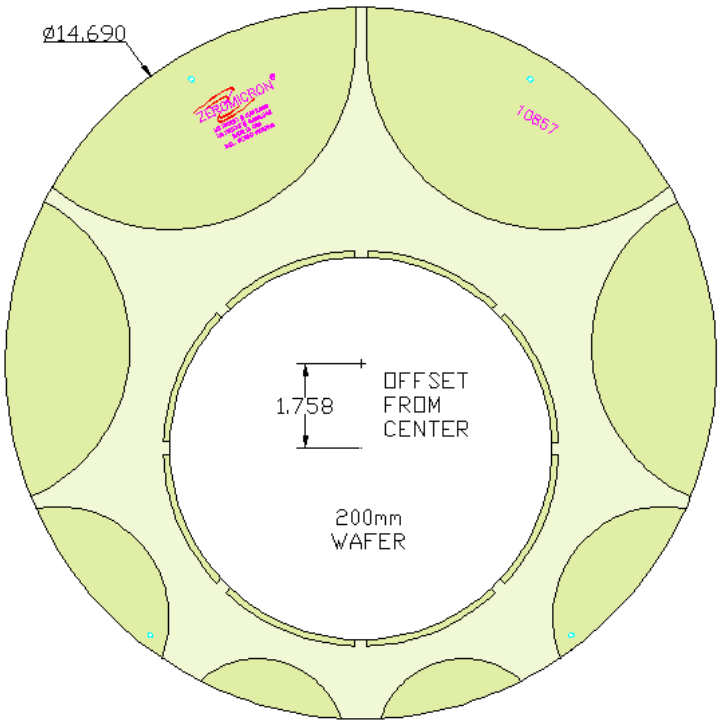
Polish head size:	14.690 inch (373 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 200mm WAFER – 1 POCKET – W/ CIG



Diameter = 14.690 inches

Wafer Size = 200 mm
("8 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 10857)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

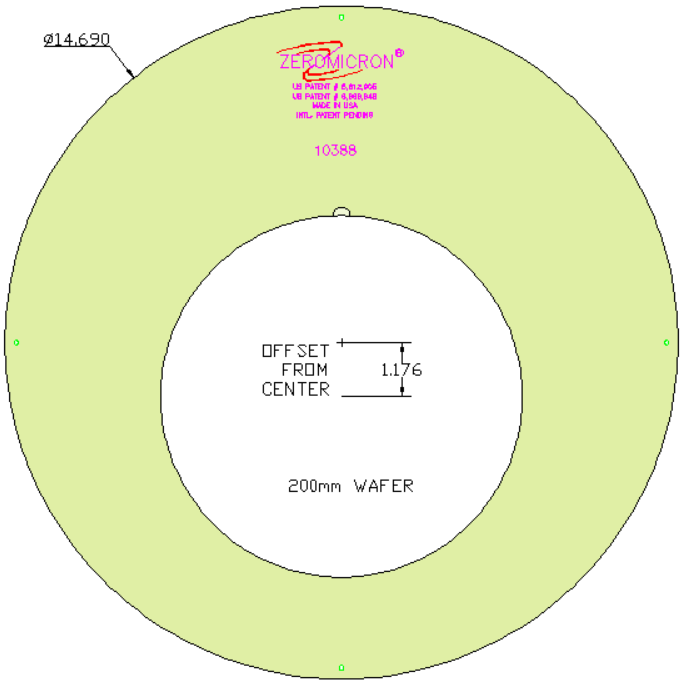
Polish head size:	14.690 inch (373 mm)*
Wafer size:	200 mm ("8 inch")*
Wafer pocket range:	200.2 mm to 201.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 200mm WAFER – 1 POCKET – NOTCHED



Diameter = 14.690 inches

Wafer Size = 200mm
("8 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#10388).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

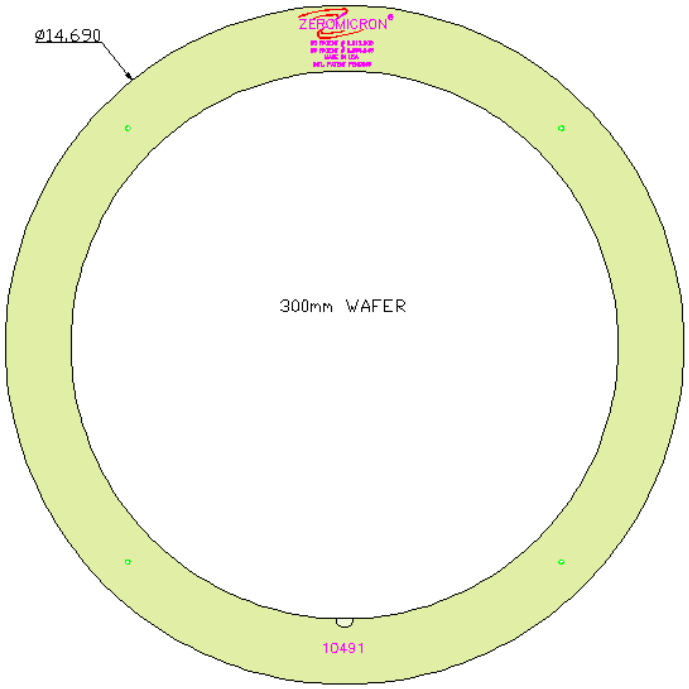
Polish head size:	14.690 inch (373 mm)*
Wafer size:	200 mm ("8 inch")*
Wafer pocket range:	200.2 mm to 201.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 300mm WAFER – 1 POCKET – NOTCHED



Diameter = 14.690 inches

Wafer Size = 300mm
("12 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#10491).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

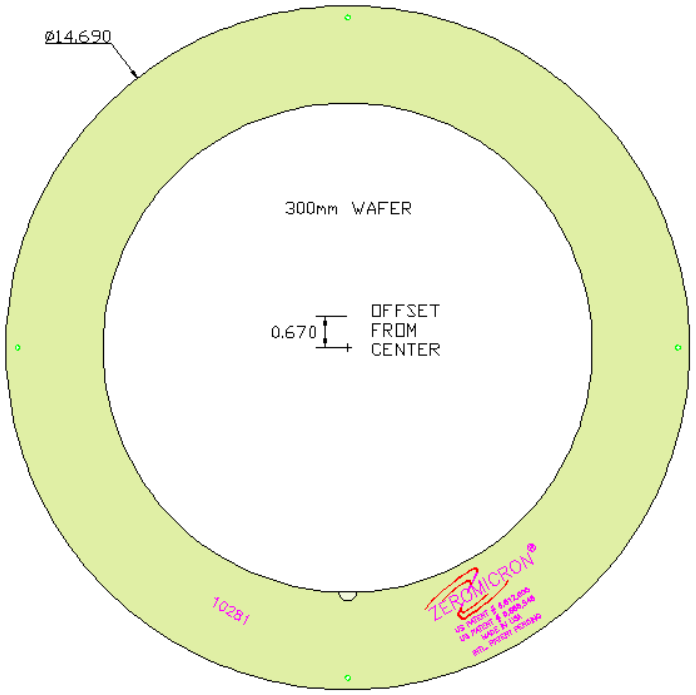
Polish head size:	14.690 inch (373 mm)*
Wafer size:	300x mm ("12 inch")*
Wafer pocket range:	300.2 mm to 301.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.690" DIA. – 300mm WAFER – 1 POCKET – NOTCHED



Diameter = 14.690 inches

Wafer Size = 300mm
("12 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#10281).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

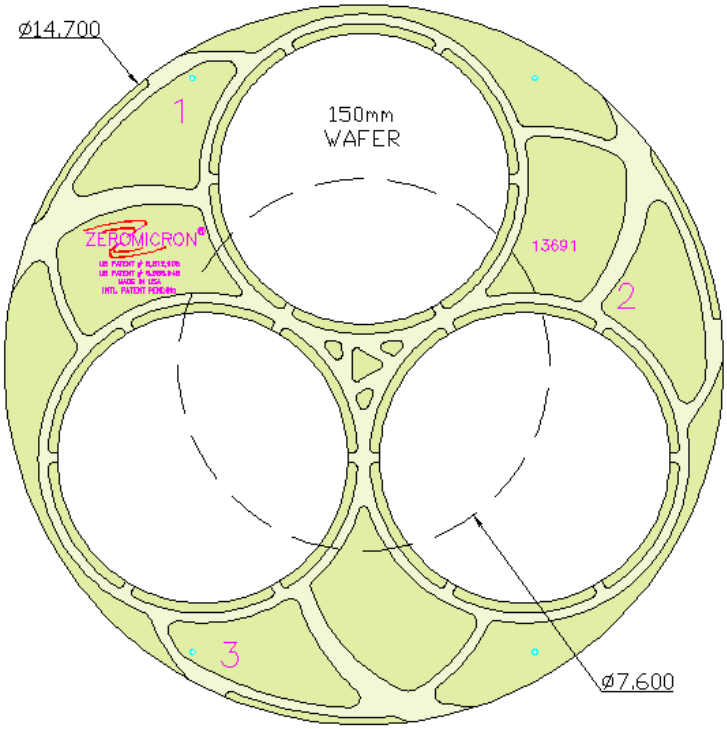
Polish head size:	14.690 inch (373 mm)*
Wafer size:	3000 mm ("12inch")*
Wafer pocket range:	300.2 mm to 301.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 14.700" DIA. – 150mm WAFER – 3 POCKETS – W/ CIG



Diameter = 14.700 inches

Wafer Size = 150 mm
("6 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 13691)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

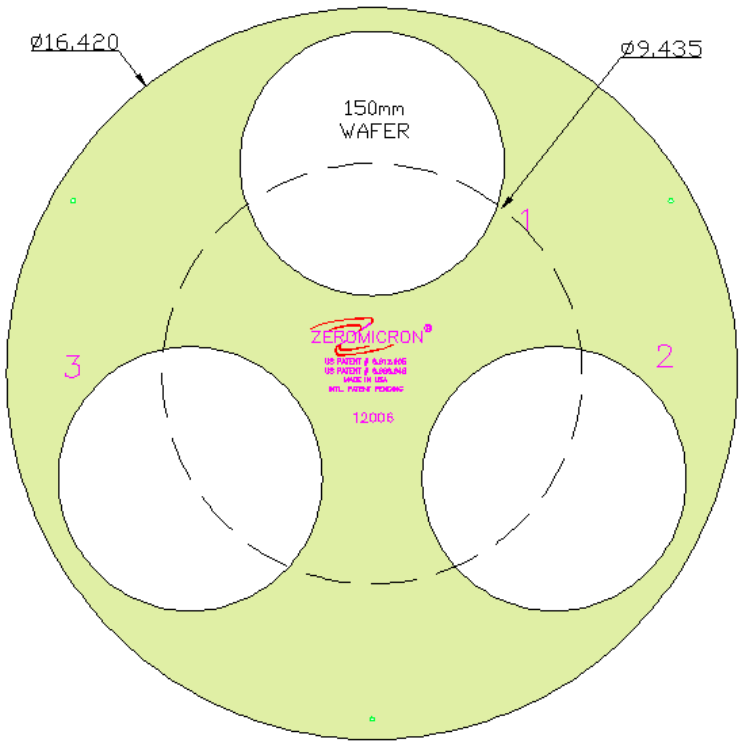
Polish head size:	14.700 inch (373 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150 mm to 151.1 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 16.420" DIA. – 150mm WAFER – 3 POCKETS



Diameter = 16.420 inches

Wafer Size = 150mm
("6 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#12006).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

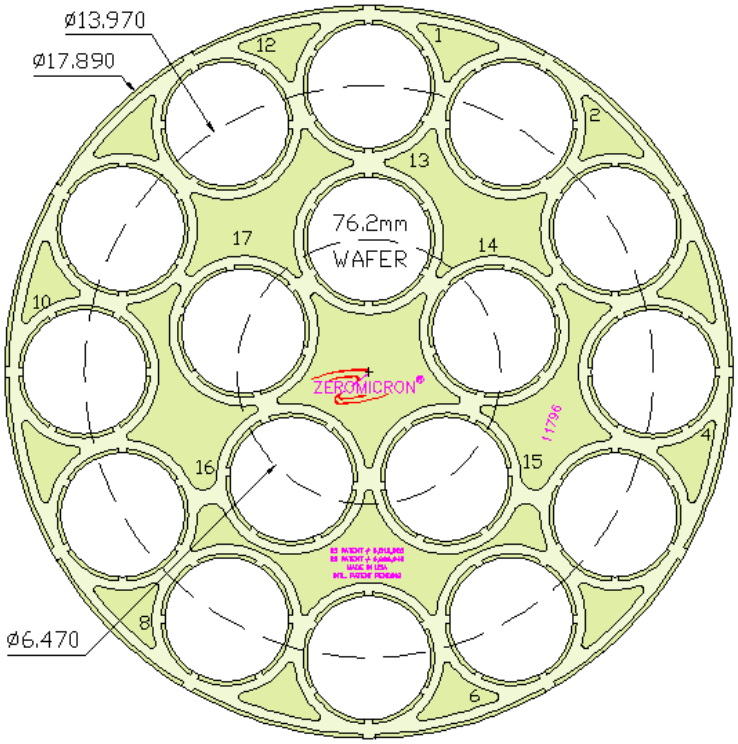
Polish head size:	16.420 inch (417 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150 mm to 151.1 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 17.890" DIA. – 76.2mm WAFER – 17 POCKETS – W/ CIG



Diameter = 17.890 inches

Wafer Size = 76.2 mm
(3 inch)

Number of Pockets = 17

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 11796)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

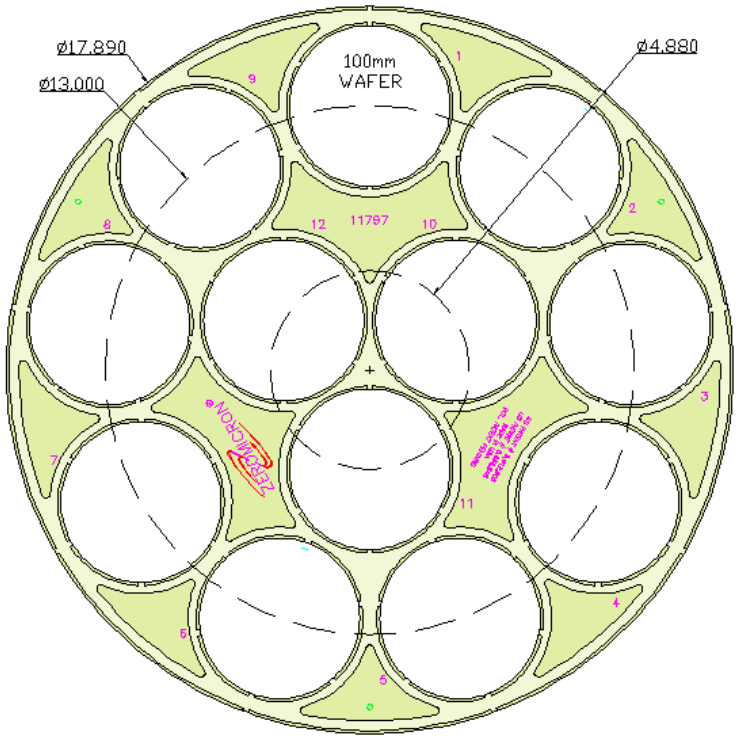
Polish head size:	17.890 inch (454 mm)*
Wafer size:	76.2 mm (3 inch)* (pockets have engraved numbers)
Wafer pocket range:	76.4 mm to 77.4 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 17.890" DIA. – 100mm WAFER – 12 POCKETS – W/ CIG



Diameter = 17.890 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 12

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 11797)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

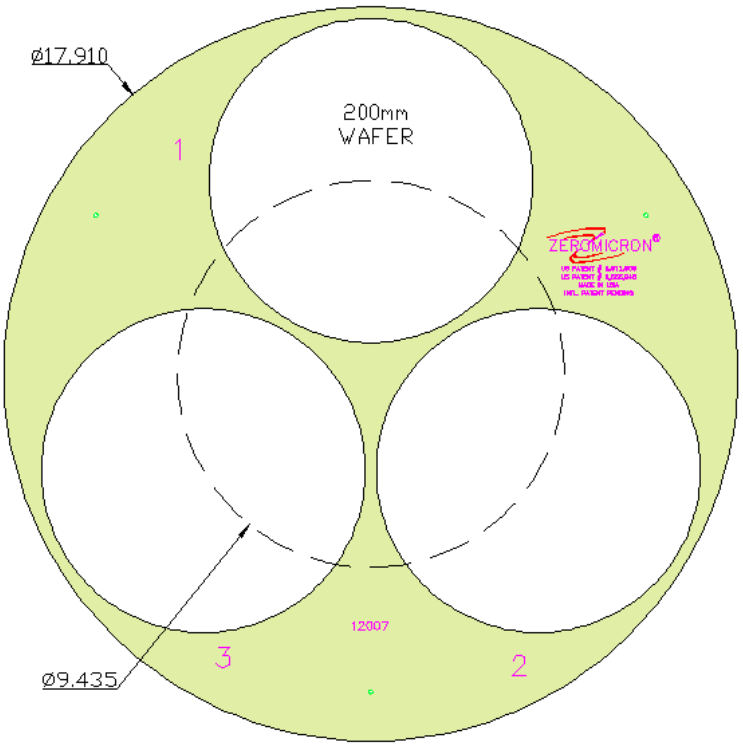
Polish head size:	17.890 inch (454 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 17.910" DIA. – 200mm WAFER – 3 POCKETS



Diameter = 17.910 inches

Wafer Size = 200mm
("8 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#12007).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

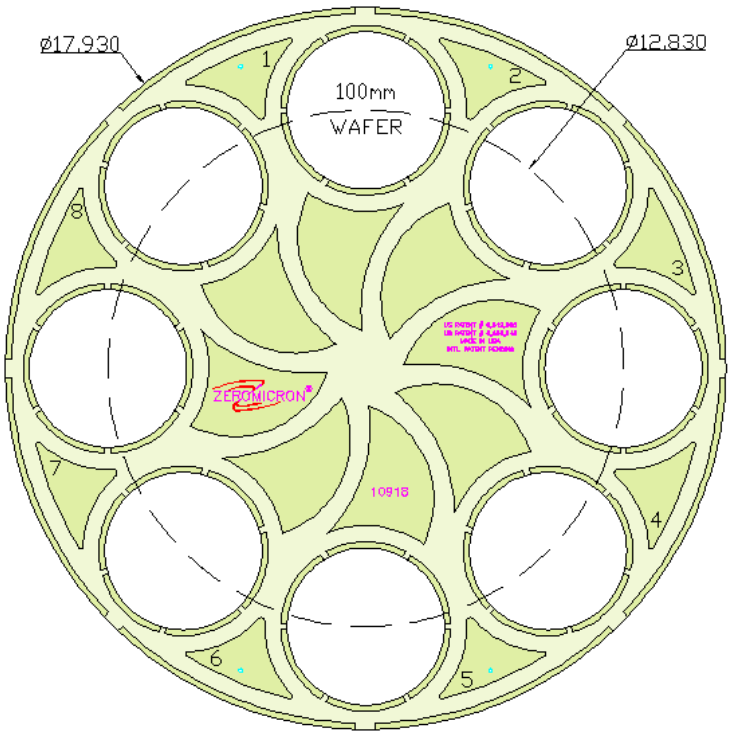
Polish head size:	17.910 inch (455x mm)*
Wafer size:	200 mm ("8 inch")* (pockets have engraved numbers)
Wafer pocket range:	200.2.x mm to 201.1 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 17.930" DIA. – 100mm WAFER – 8 POCKETS – W/ CIG



Diameter = 17.930 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 8

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 10918)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

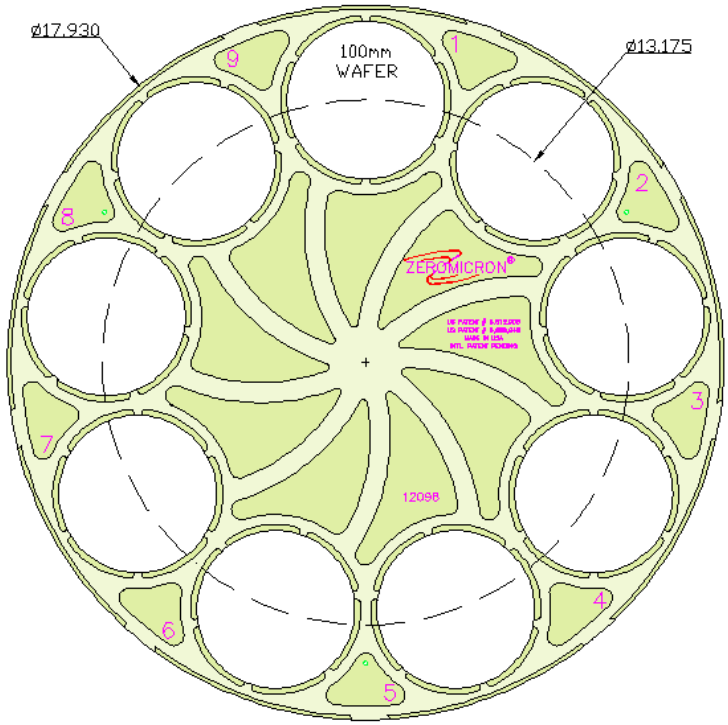
Polish head size:	17.930 inch (455 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 17.930" DIA. – 100mm WAFER – 9 POCKETS – W/ CIG



Diameter = 17.930 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 9

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 12098)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

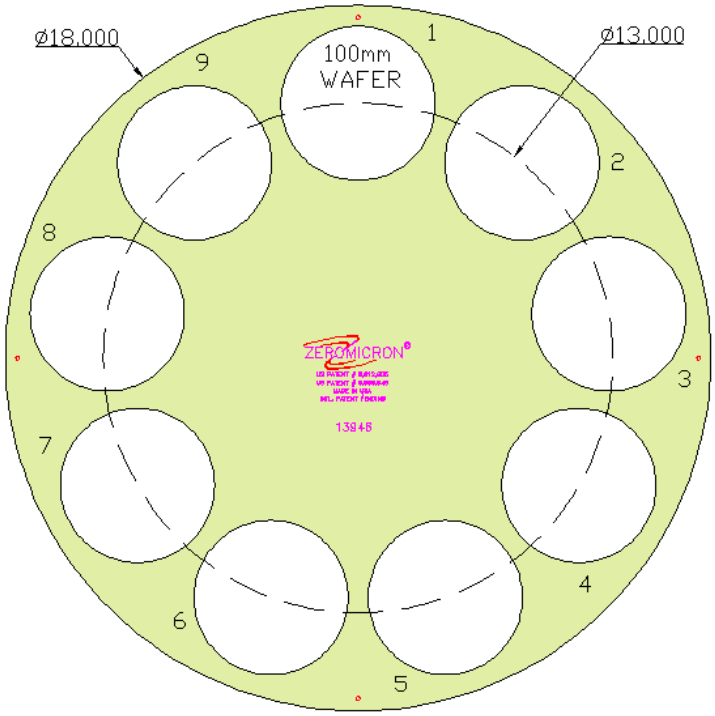
Polish head size:	17.930 inch (455 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.000" DIA. – 100mm WAFER – 9 POCKETS



Diameter = 18.000 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 9

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#13946).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

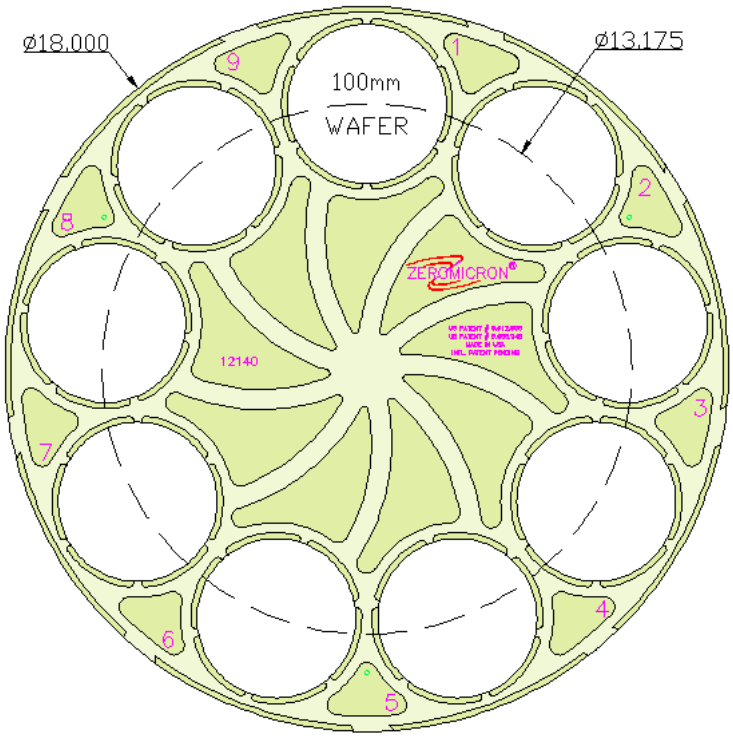
Polish head size:	18.000 inch (457 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.000" DIA. – 100mm WAFER – 9 POCKETS – W/ CIG



Diameter = 18.000 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 9

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 12140)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

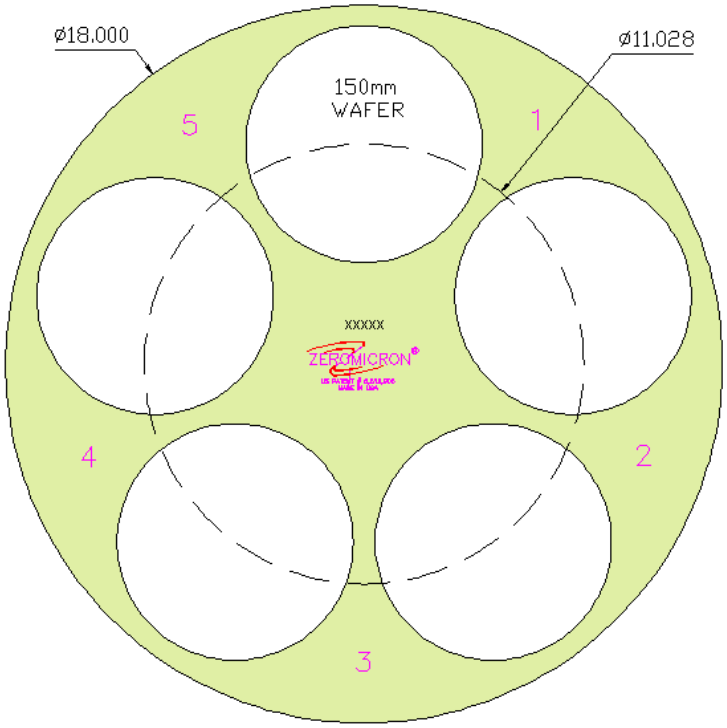
Polish head size:	18.000 inch (457 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100 mm to 101.1 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.000" DIA. – 150mm WAFER – 5 POCKETS



Diameter = 18.000 inches

Wafer Size = 150 mm
("6 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame. (#)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

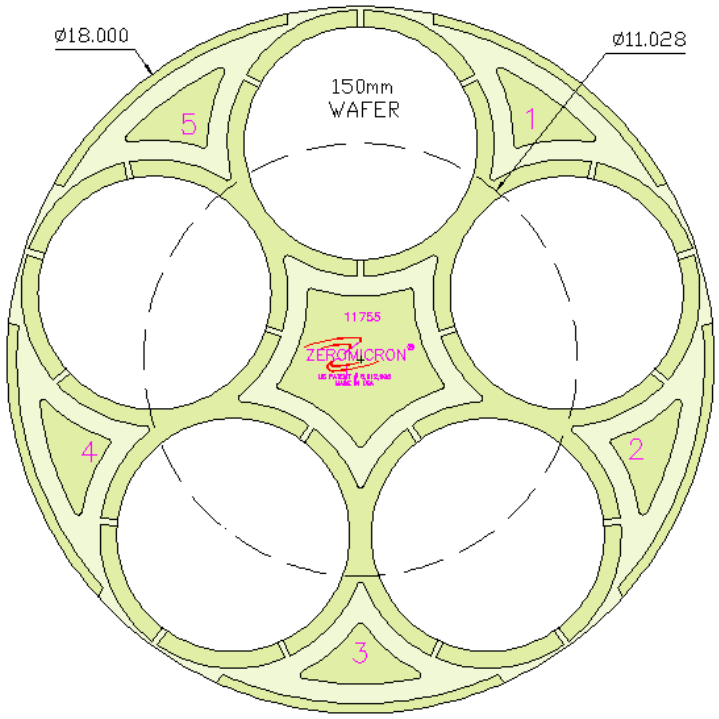
Polish head size:	18.000 inch (457 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.000" DIA. – 150mm WAFER – 5 POCKETS – W/ CIG



Diameter = 18.000 inches

Wafer Size = 150 mm
("6 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 11755)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

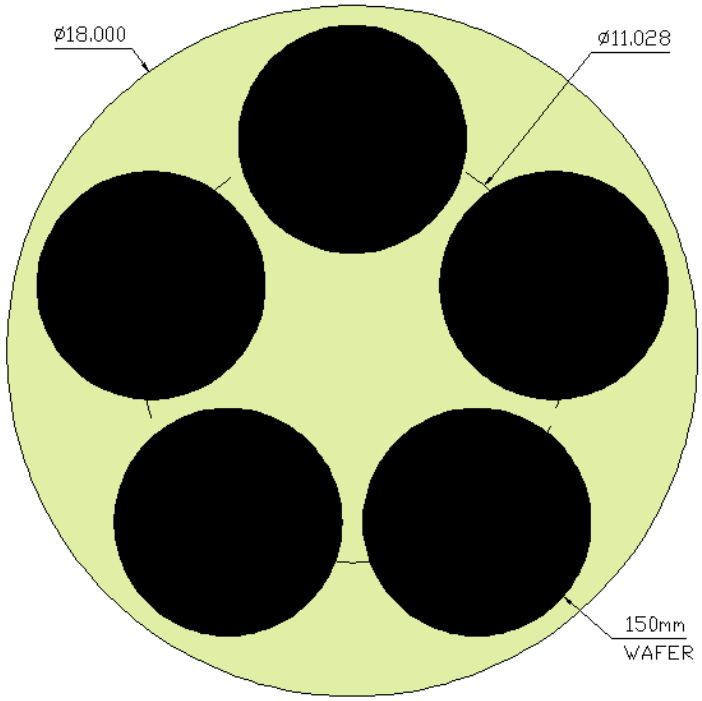
Polish head size:	18.000 inch (457 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

NEW CLASSIC TEMPLATE: 18.000" DIA. – 150mm WAFER – 5 POCKETS



Diameter = 18.000 inches

Wafer Size = 150 mm
("6 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the high strength construction in an industry standard format product.

This Catalog Item defines the configuration and features of this Template Frame. (#)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

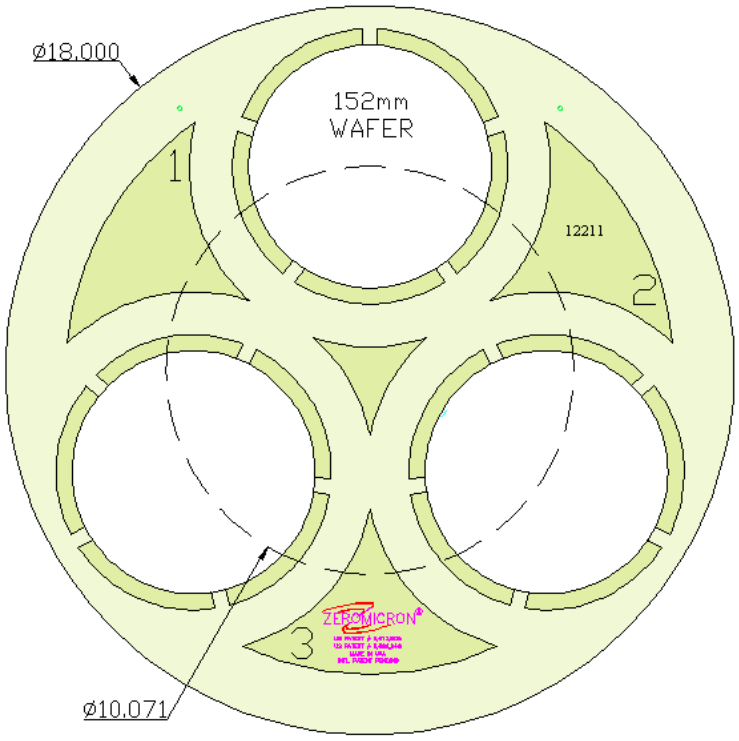
Polish head size:	18.000 inch (457 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.7mm* (to accommodate 150.2 new material to 150.5 reclaim material)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All templates in this Frame format are constructed using a design that prevents frame to base separation thus providing long life and maximum blow-out prevention for greater tool up time and lower operating costs.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.000" DIA. – 152mm WAFER – 3 POCKETS – W/ CIG



Diameter = 18.000 inches

Wafer Size = 152 mm
(6 inch)

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 12211)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

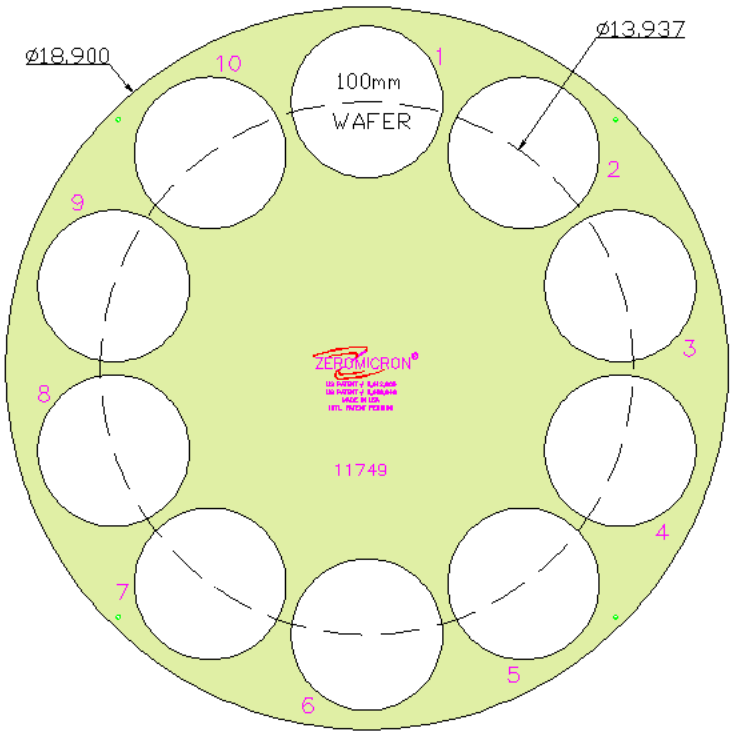
Polish head size:	18.000 inch (457 mm)*
Wafer size:	152 mm (6inch)* (pockets have engraved numbers)
Wafer pocket range:	This is sized for a special application – other sizes available on request
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.900" DIA. – 100mm WAFER – 10 POCKETS



Diameter = 18.900 inches

Wafer Size = 100mm
("4" inch")

Number of Pockets = 10

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#11749).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

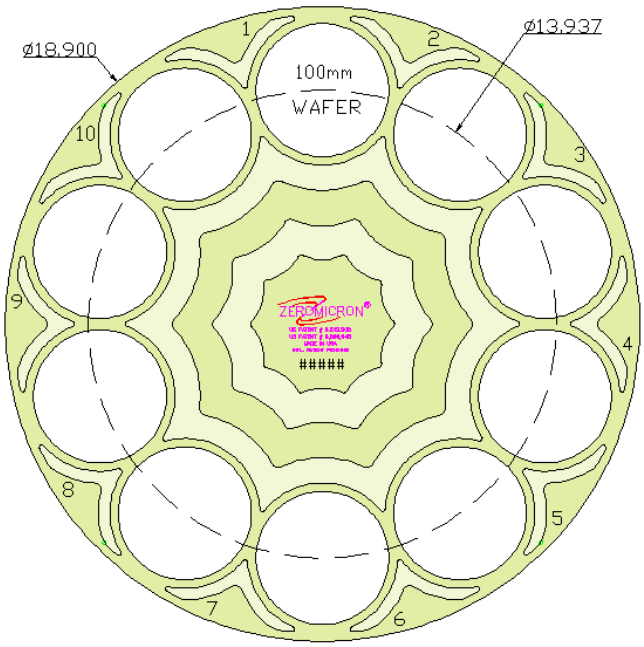
Polish head size:	18.900 inch (480 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.900" DIA. – 100mm WAFER – 10 POCKETS
WITH BACKSIDE RELIEF



Diameter = 18.900 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 10

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning PadSert System requiring deep pockets.

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

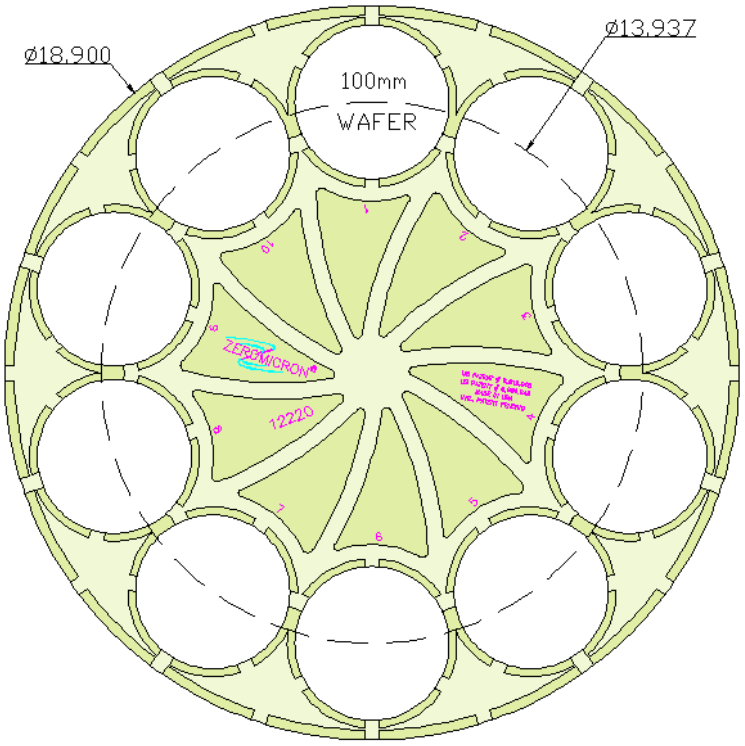
Polish head size:	18.900 inch (480 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	These templates have exceptionally deep pockets for use with the PadSert with the backside relief to allow pressure to be concentrated on the wafer.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.900" DIA. – 100mm WAFER – 10 POCKETS – W/ CIG



Diameter = 18.900 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 10

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 12220)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

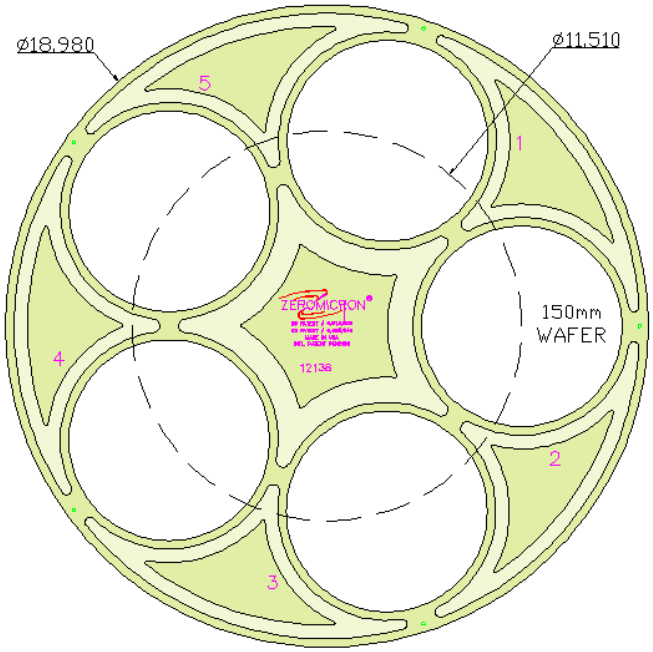
Polish head size:	18.900 inch (480 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.980" DIA. – 150mm WAFER – 5 POCKETS
WITH BACKSIDE RELIEF



Diameter = 18.980 inches

Wafer Size = 150mm
("6 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning PadSert System requiring deep pockets.

This Catalog Item defines the configuration and features of this Template Frame (#12138).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

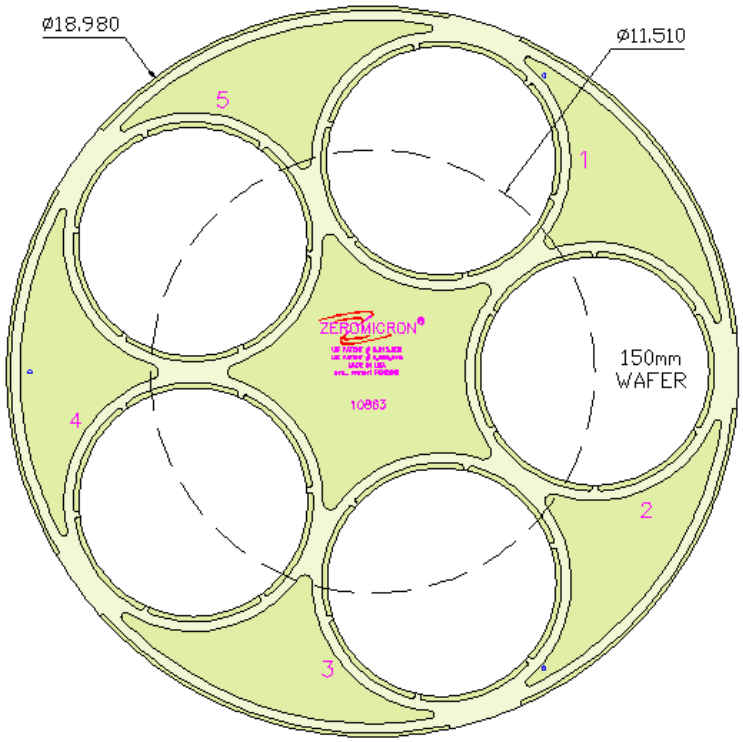
Polish head size:	18.980 inch (482 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	These templates have exceptionally deep pockets for use with the PadSert with the backside relief to allow pressure to be concentrated on the wafer.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.980" DIA. – 150mm WAFER – 5 POCKETS – W/ CIG



Diameter = 18.980 inches

Wafer Size = 150 mm
("6 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 10863)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

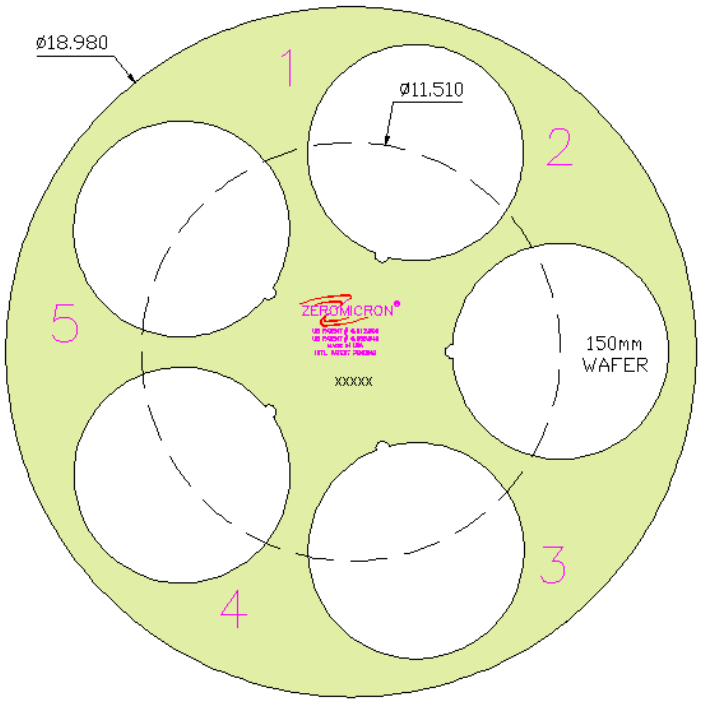
Polish head size:	18.980 inch (482 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.980" DIA. - 150mm WAFER - 5 POCKETS - NOTCHED THRU



Diameter = 18.980 inches

Wafer Size = 150mm
("6 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

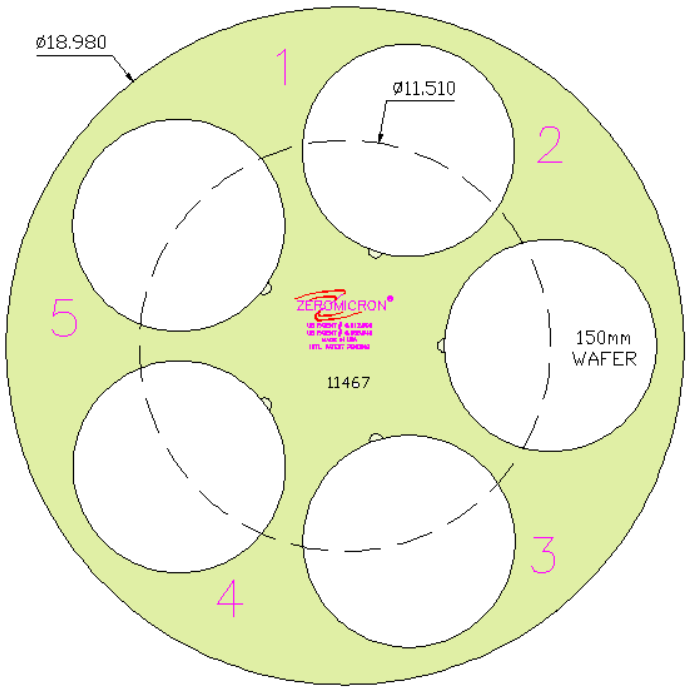
Polish head size:	18.980 inch (482 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.980" DIA. – 150mm WAFER – 5 POCKETS – NOTCHED



Diameter = 18.980 inches

Wafer Size = 150mm
("6 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#11467).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

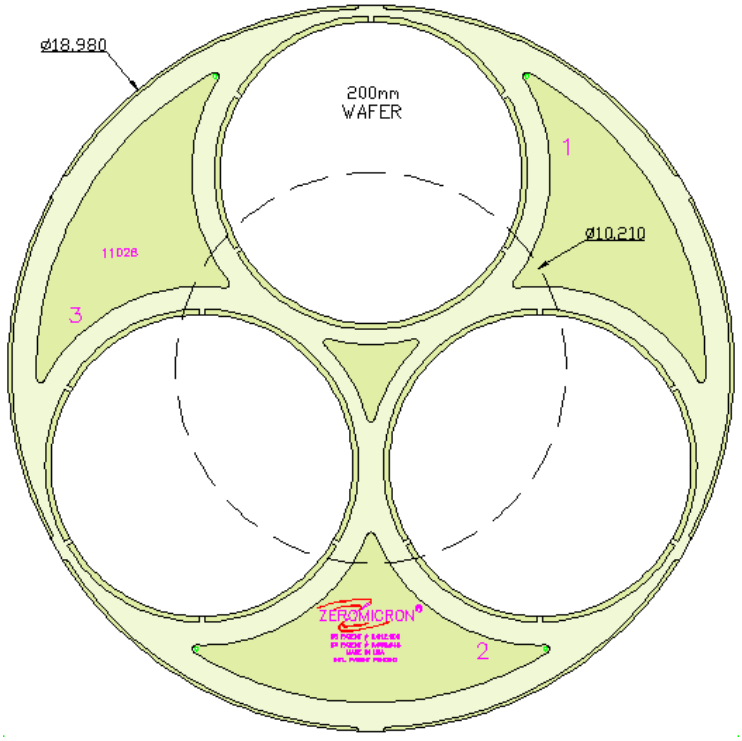
Polish head size:	18.980 inch (482 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.980" DIA. – 200mm WAFER – 3 POCKETS – W/ CIG



Diameter = 18.980 inches

Wafer Size = 200 mm
("8 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 11026)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

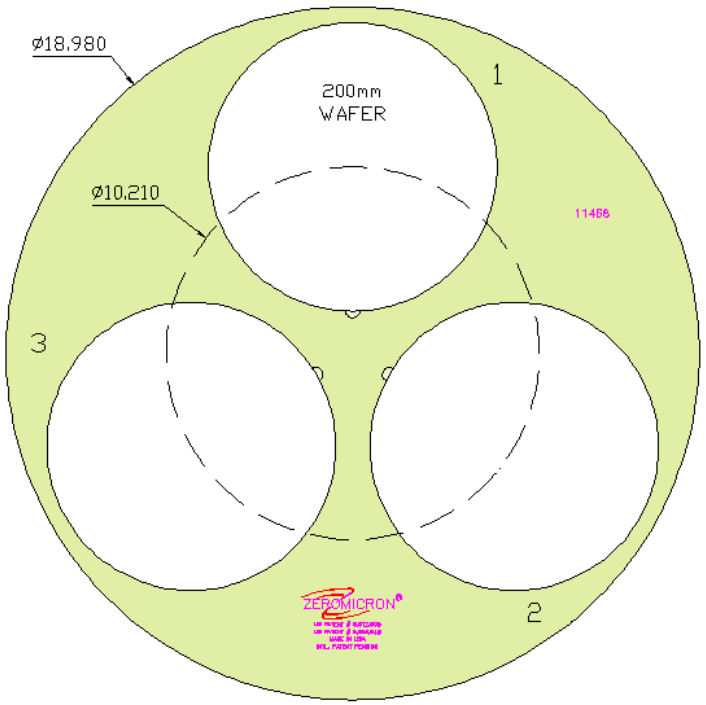
Polish head size:	18.980 inch (482 mm)*
Wafer size:	200 mm ("8 inch")* (pockets have engraved numbers)
Wafer pocket range:	200.2 mm to 201.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 18.980" DIA. – 200mm WAFER – 3 POCKETS – NOTCHED



Diameter = 18.980 inches

Wafer Size = 200mm
("8 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#11468).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

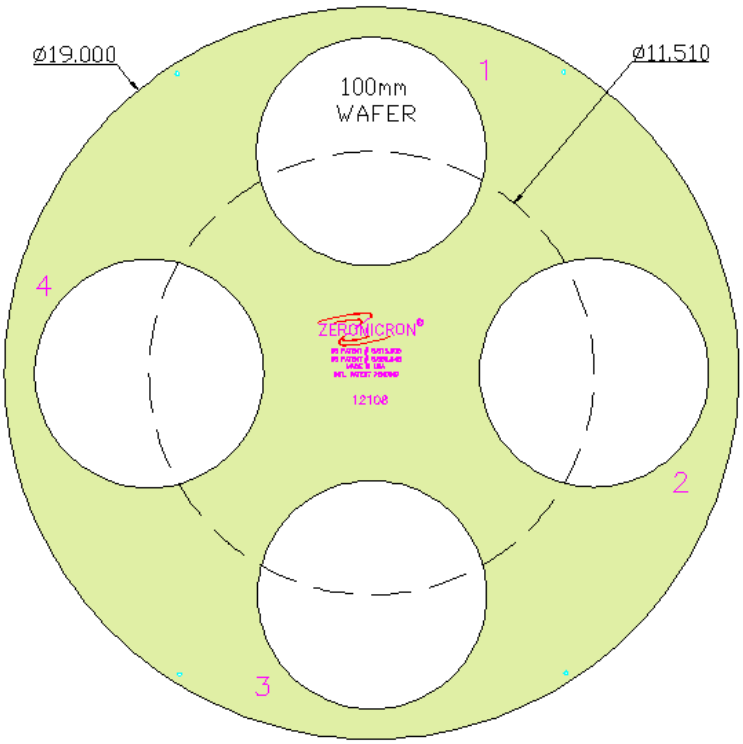
Polish head size:	18.980 inch (482 mm)*
Wafer size:	200 mm ("8 inch")* (pockets have engraved numbers)
Wafer pocket range:	200.2 mm to 201.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 19.000" DIA. – 100mm WAFER – 4 POCKETS



Diameter = 19.000 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 4

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#12108).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

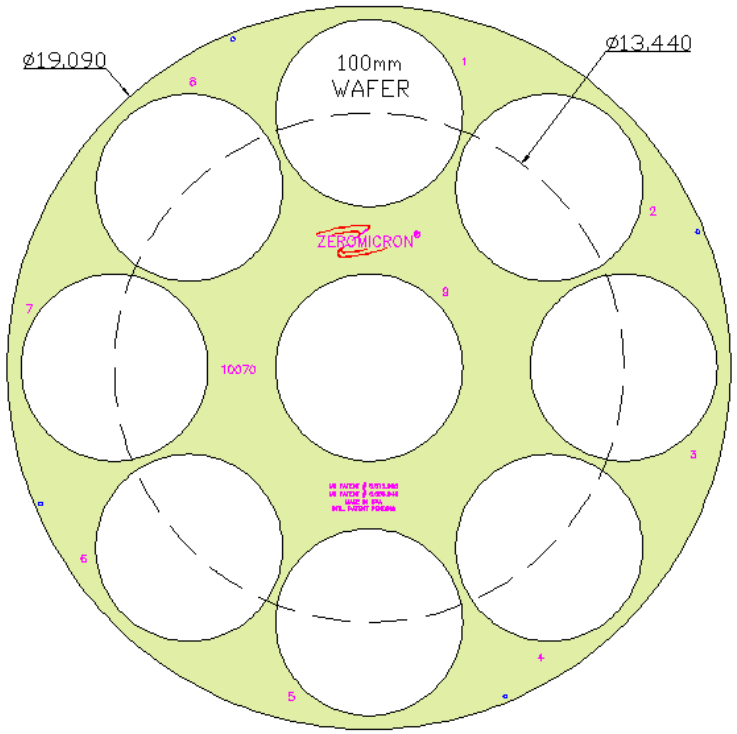
Polish head size:	19.000 inch (483 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 19.090" DIA. – 100mm WAFER – 8 POCKETS



Diameter = 19.090 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 8

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#10070).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

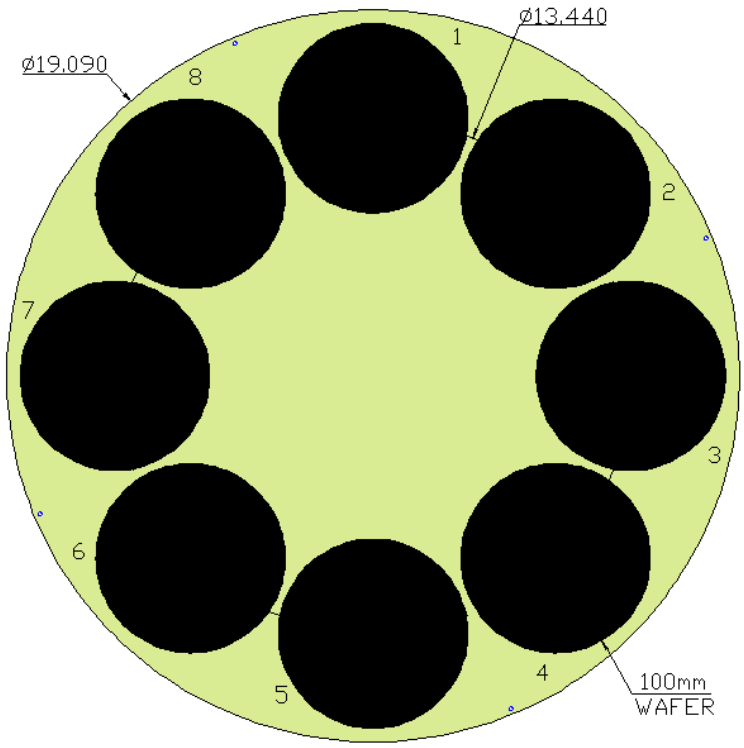
Polish head size:	19.090 inch (485 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100 mm to 101 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

NEW CLASSIC TEMPLATE: 19.090" DIA. – 100mm WAFER – 8 POCKETS



Diameter = 19.090 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 8

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the high strength construction in an industry standard format product.

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

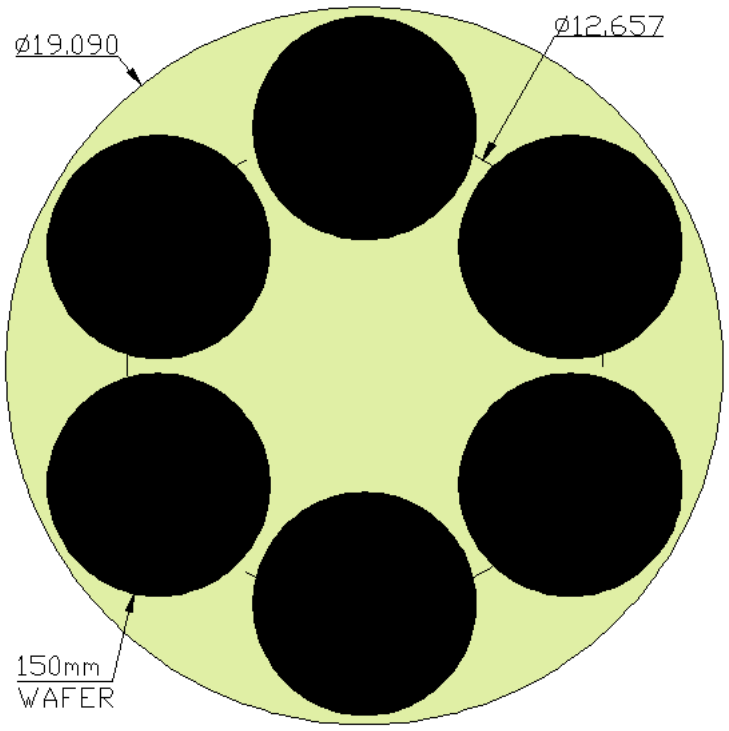
Polish head size:	19.090 inch (485 mm)*
Wafer size:	100 mm ("4 inch")* (pockets are numbered for ease of use)
Wafer pocket diameter:	100.7mm* (to accommodate 100.2 new material to 100.5 reclaim material)
Wafer thickness:	125um to greater than 1mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All templates in this Frame format are constructed using a design that prevents frame to base separation thus providing long life and maximum blow-out prevention for greater tool up time and lower operating costs.
Application:	This template is designed for use with industry standard tools. It is a one piece construction unlike the more advanced ZeroMicron patented templates and is designed for automated tool handling systems.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

NEW CLASSIC TEMPLATE: 19.090" DIA. – 150mm WAFER – 6 POCKETS



Diameter = 19.090 inches

Wafer Size = 150mm
("6 inch")

Number of Pockets = 6

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the high strength construction in an industry standard format product.

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

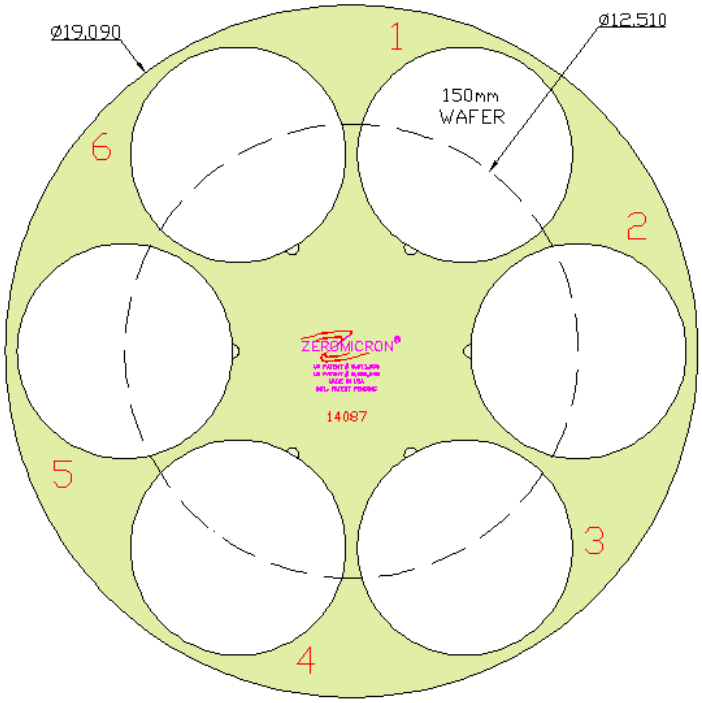
Polish head size:	19.090 inch (485 mm)*
Wafer size:	150 mm ("6 inch")* (pockets are numbered for ease of use)
Wafer pocket diameter:	150.7mm* (to accommodate 150.2 new material to 150.5 reclaim material)
Wafer thickness:	125um to greater than 1mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All templates in this Frame format are constructed using a design that prevents frame to base separation thus providing long life and maximum blow-out prevention for greater tool up time and lower operating costs.
Application:	This template is designed for use with industry standard tools. It is a one piece construction unlike the more advanced ZeroMicron patented templates and is designed for automated tool handling systems.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 19.090" DIA. – 150mm WAFER – 6 POCKETS – NOTCHED



Diameter = 19.090 inches

Wafer Size = 150mm
("6 inch")

Number of Pockets = 6

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#14087).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

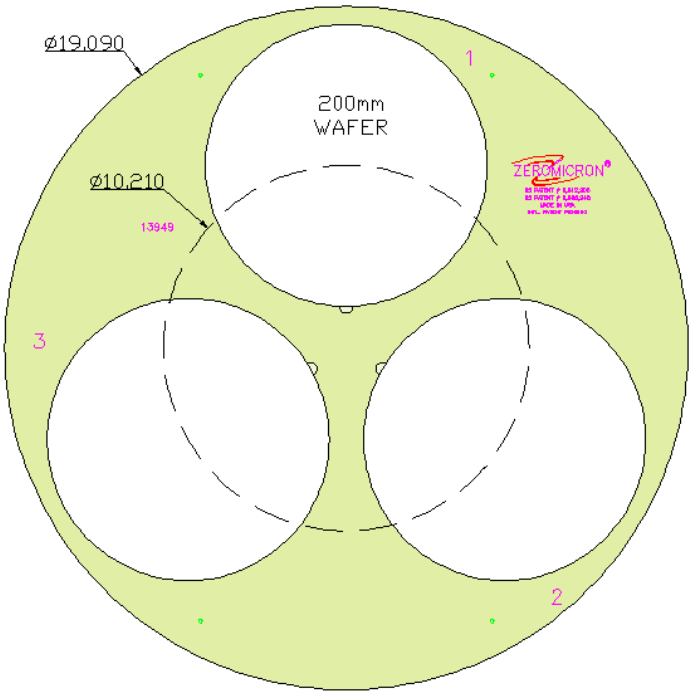
Polish head size:	19.090 inch (485 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 19.090" DIA. – 200mm WAFER – 3 POCKETS – NOTCHED



Diameter = 19.090 inches

Wafer Size = 200mm
("8 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#13949).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

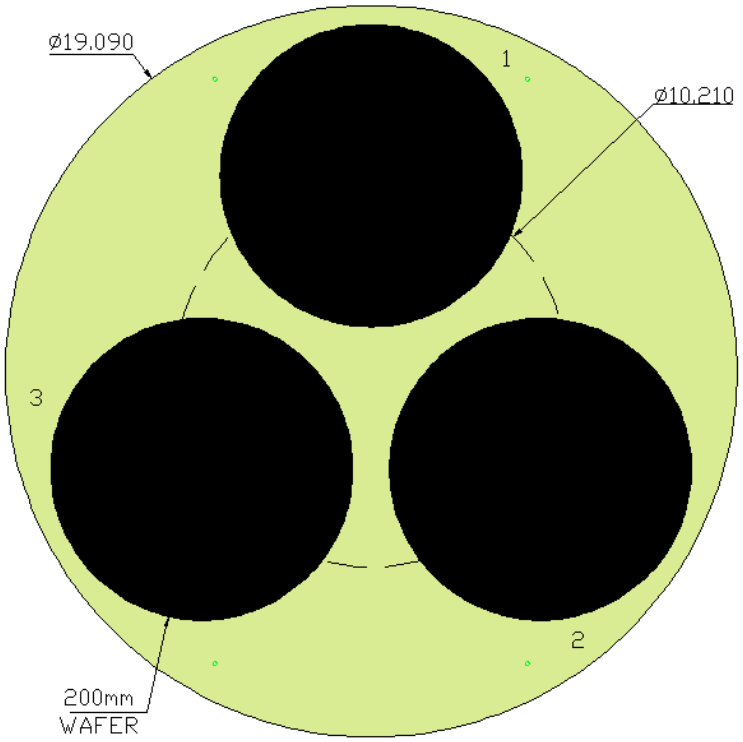
Polish head size:	19.090 inch (485 mm)*
Wafer size:	200 mm ("8 inch")* (pockets have engraved numbers)
Wafer pocket range:	200.2 mm to 201.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

NEW CLASSIC TEMPLATE: 19.090" DIA. – 200mm WAFER – 3 POCKETS



Diameter = 19.090 inches

Wafer Size = 200mm
("8 inch")

Number of Pockets = 3

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the high strength construction in an industry standard format product.

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

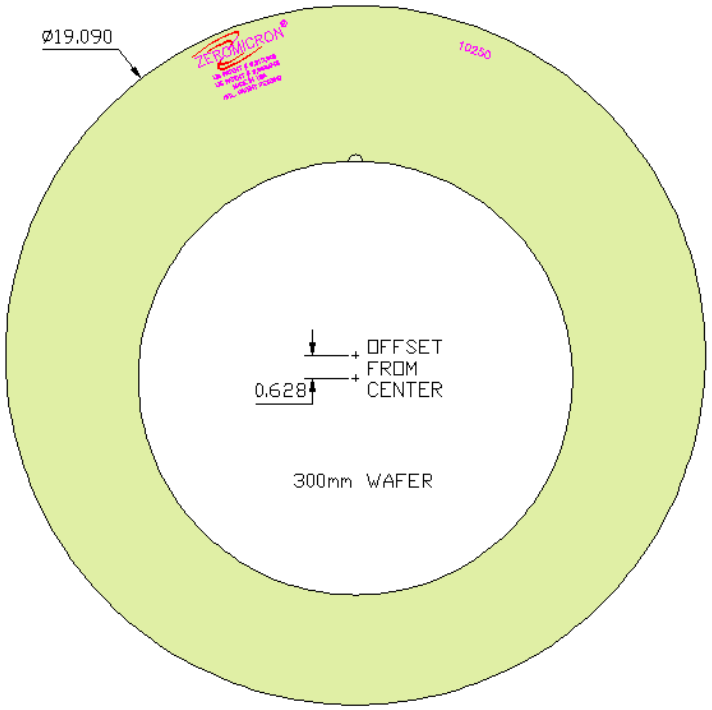
Polish head size:	19.090 inch (485 mm)*
Wafer size:	200 mm ("8 inch")* (pockets are numbered for ease of use)
Wafer pocket diameter:	200.7mm* (to accommodate 200.2 new material to 200.5 reclaim material)
Wafer thickness:	125um to greater than 1mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All templates in this Frame format are constructed using a design that prevents frame to base separation thus providing long life and maximum blow-out prevention for greater tool up time and lower operating costs.
Application:	This template is designed for use with industry standard tools. It is a one piece construction unlike the more advanced ZeroMicron patented templates and is designed for automated tool handling systems.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 19.090" DIA. – 300mm WAFER – 1 POCKET – NOTCHED



Diameter = 19.090 inches

Wafer Size = 300mm
("12 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#10250).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

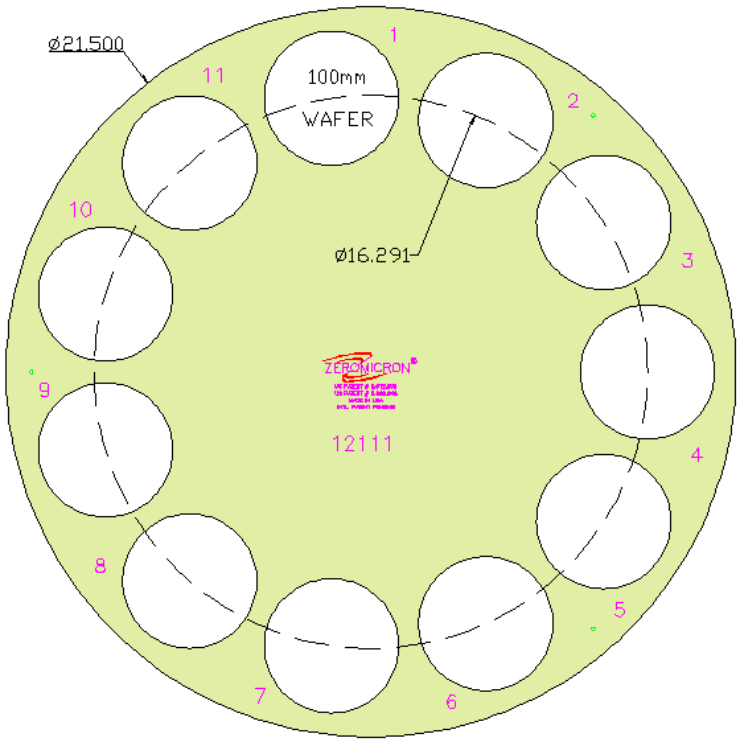
Polish head size:	19.090 inch (485 mm)*
Wafer size:	300 mm ("12 inch")*
Wafer pocket range:	300.2 mm to 301.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 21.500" DIA. – 100mm WAFER – 11 POCKETS



Diameter = 21.500 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 11

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System.

This Catalog Item defines the configuration and features of this Template Frame (#12111).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

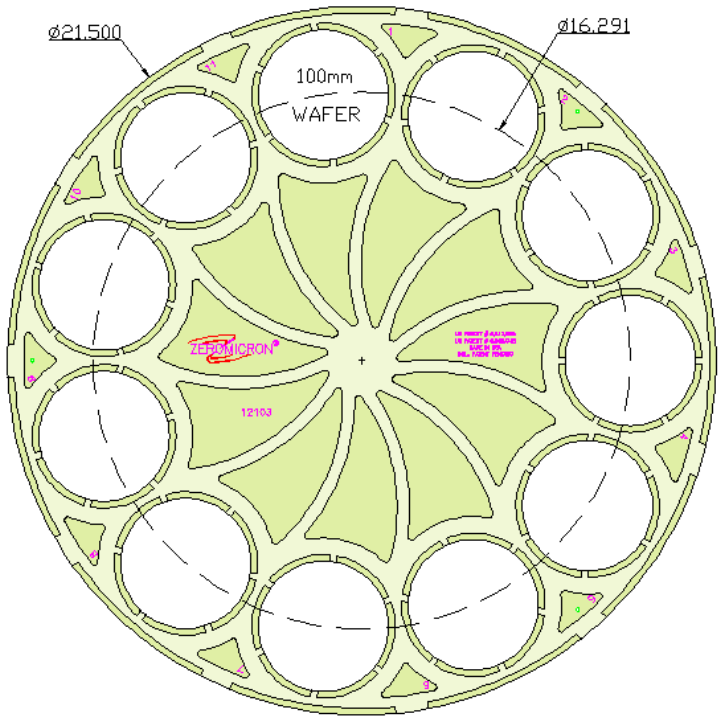
Polish head size:	21.500 inch (546 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 21.500" DIA. – 100mm WAFER – 11 POCKETS – W/ CIG



Diameter = 21.500 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 11

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 12103)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

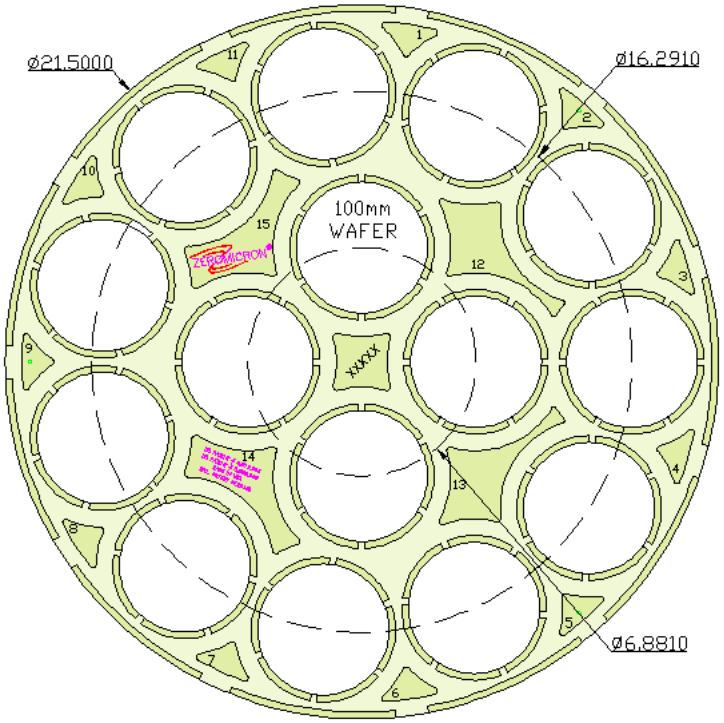
Polish head size:	21.500 inch (546 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 21.500" DIA. – 100mm WAFER – 15 POCKETS – W/ CIG



Diameter = 21.500 inches

Wafer Size = 100 mm
("4 inch")

Number of Pockets = 15

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# TBD)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

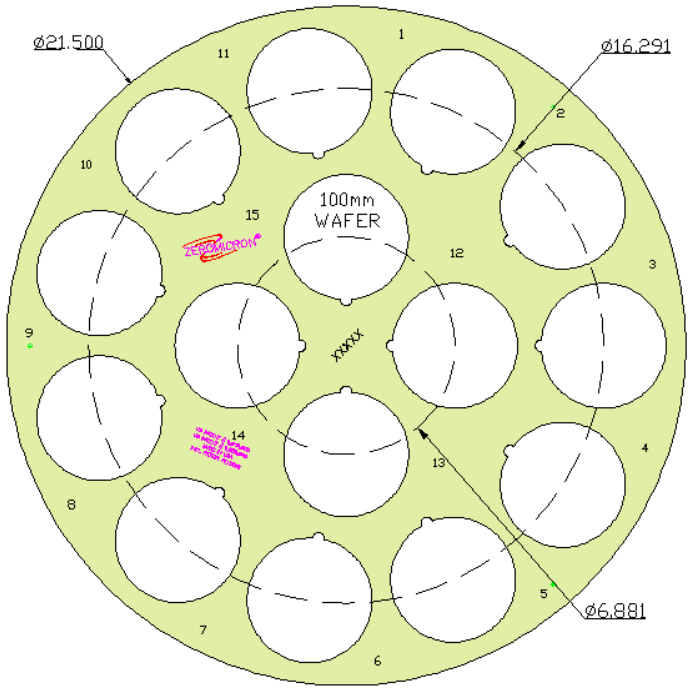
Polish head size:	21.5000 inch (546 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 21.500" DIA. - 100mm WAFER - 15 POCKET - NOTCHED THRU



Diameter = 21.500 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 15

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

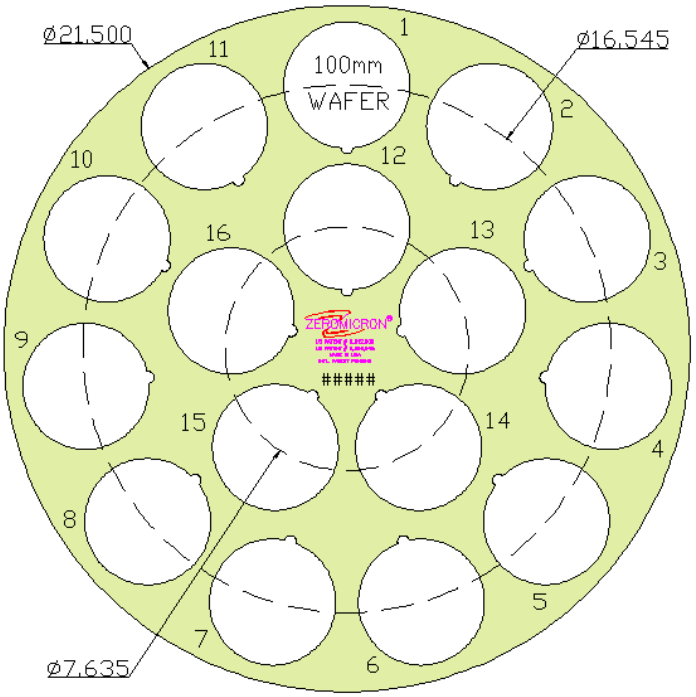
Polish head size:	21.500 inch (546 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 21.500" DIA. - 100mm WAFER - 16 POCKET - NOTCHED THRU



Diameter = 21.500 inches

Wafer Size = 100mm
("4 inch")

Number of Pockets = 16

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

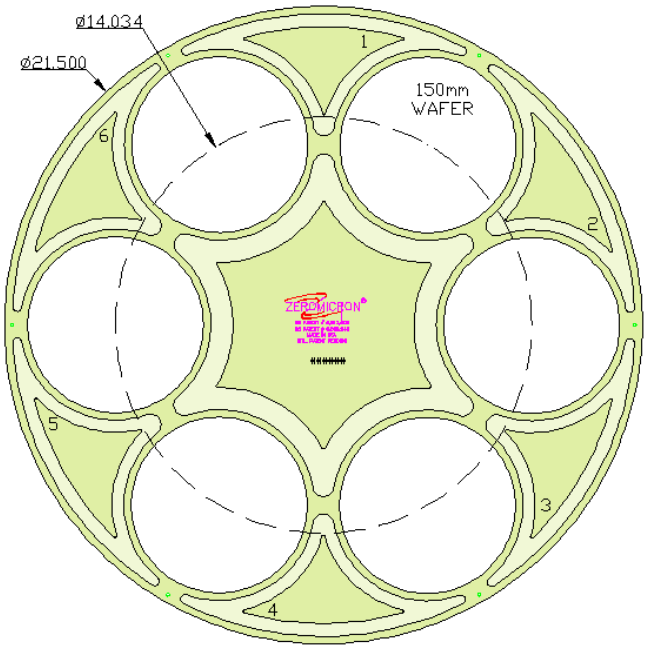
Polish head size:	21.500 inch (546 mm)*
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 21.500" DIA. – 150mm WAFER – 6 POCKETS
WITH BACKSIDE RELIEF



Diameter = 21.500 inches

Wafer Size = 150mm
("6 inch")

Number of Pockets = 6

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning PadSert System requiring deep pockets.

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

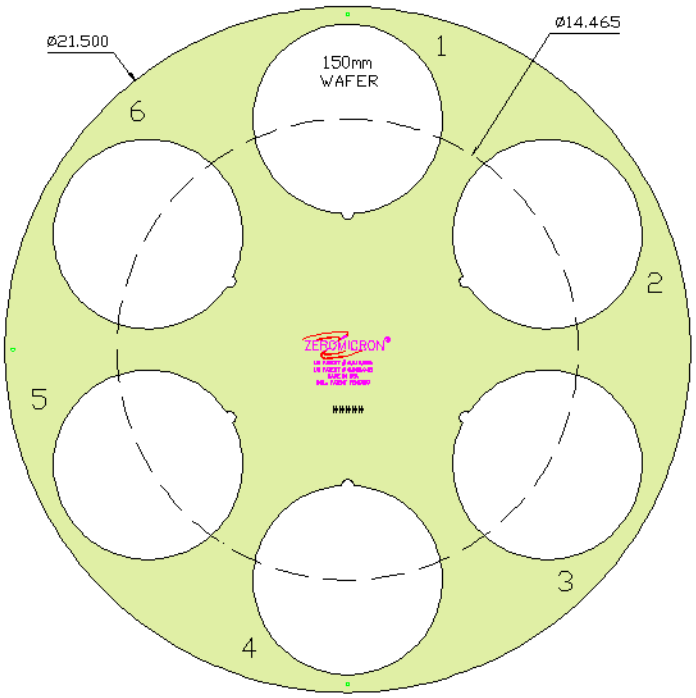
Polish head size:	21.500 inch (546 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	These templates have exceptionally deep pockets for use with the PadSert with the backside relief to allow pressure to be concentrated on the wafer.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 21.500" DIA. - 150mm WAFER - 6 POCKETS - NOTCHED THRU



Diameter = 21.500 inches

Wafer Size = 150xmm
("6 inch")

Number of Pockets = 6

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#12198).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

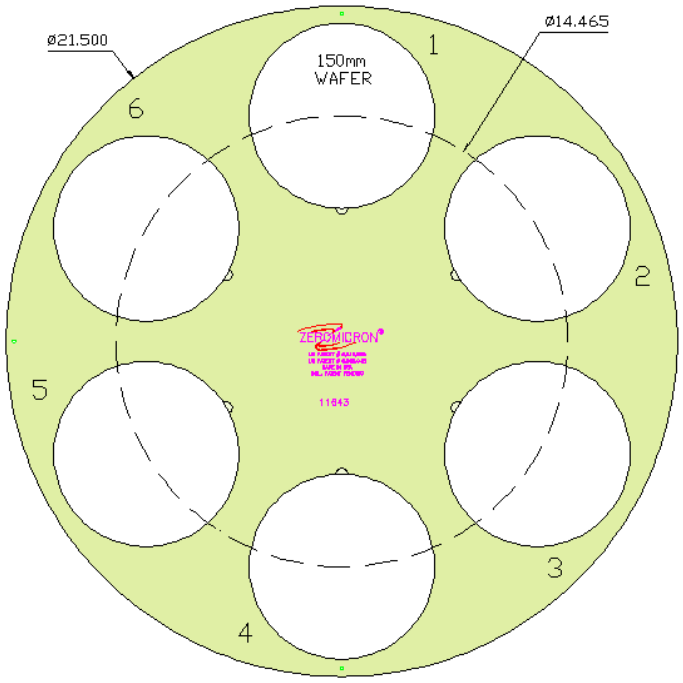
Polish head size:	21.500 inch (546 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 21.500" DIA. – 150mm WAFER – 6 POCKETS – NOTCHED



Diameter = 21.500 inches

Wafer Size = 150xmm
("6 inch")

Number of Pockets = 6

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System and incorporates a removal notch at the wafer inner diameter

This Catalog Item defines the configuration and features of this Template Frame (#11643).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

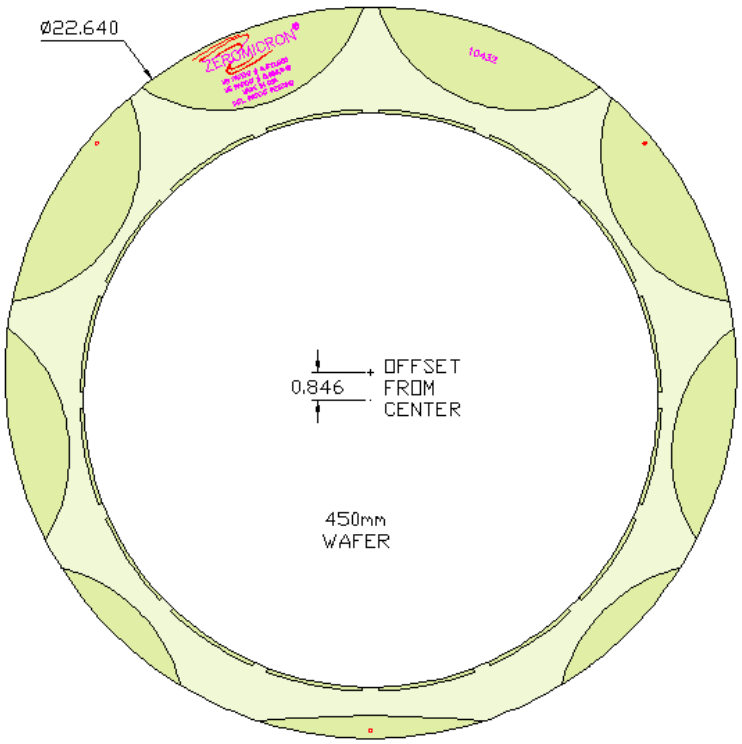
Polish head size:	21.500 inch (546 mm)*
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125um to greater than 2mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	A notch is included at the wafer ID for ease of wafer removal / replacement.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

TEMPLATE: 22.640" DIA. – 450mm WAFER – 1 POCKET – W/ CIG



Diameter = 22.640 inches

Wafer Size = 450 mm
("18 inch")

Number of Pockets = 1

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented CIG (Chemical Introducing Grooves).

This Catalog Item defines the configuration and features of this Template Frame. (# 10432)
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

Polish head size:	22.640 inch (575 mm)*
Wafer size:	450 mm ("18 inch")*
Wafer pocket range:	450.2 mm to 451.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	CIG (Chemical Introducing Grooves) are a ZeroMicron patented feature. These grooves route slurry onto the wafer surface to improve the polishing process with more even material removal at a faster rate and reduce the amount of slurry required.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3), the one piece insert ShimSert System or the PadSert System specifically designed for hard materials such as Sapphire and Silicon Carbide.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

Quick Change Products

ZeroMicron Quick Change Products are divided into two groups:

Quick Change Pads and Templates

Quick Change Pads. These are adaptable to any tool and allow polishing pads to be changed in less than one minute. A Quick Change Holder is permanently mounted on the platen. Polishing pads on mounted on a Quick Change Pad Carrier. The carriers can be placed on the holder in less than one minute and locked into place.

Quick Change Templates. These fixtures are adaptable to any tool and allow the polishing templates to be changed without removing the heavy carrier. This is a two part fixture with an adapter that mounts to the polish head carrier. Templates then mount to a light weight carrier that either magnetically or mechanically attach to the adapter.

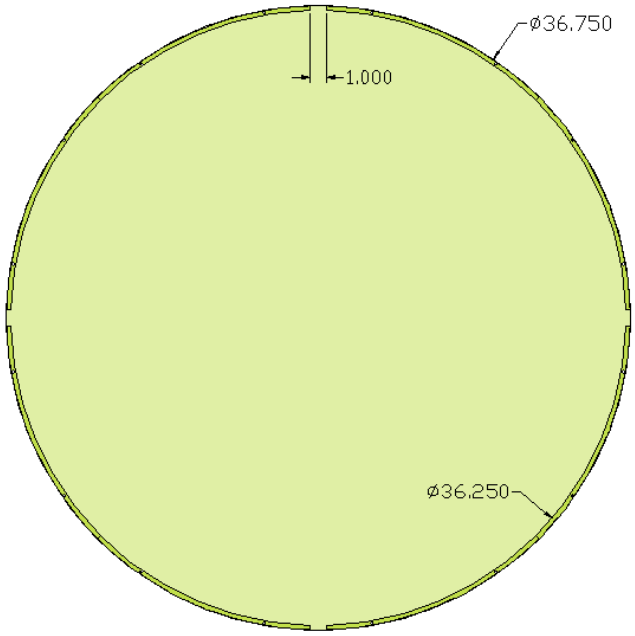
Quick Change Platen Templates and Polish Head Pad Adapters

Quick Change Platen Templates. These templates use the Quick Change Holder to accept polishing templates mounted on the platen. These templates will accept more parts and can be used for large wafers. For example, a 450mm wafer can be mounted on a 24 inch platen with a 14.7 inch polish head using the patented ZeroMicron S3 technology.

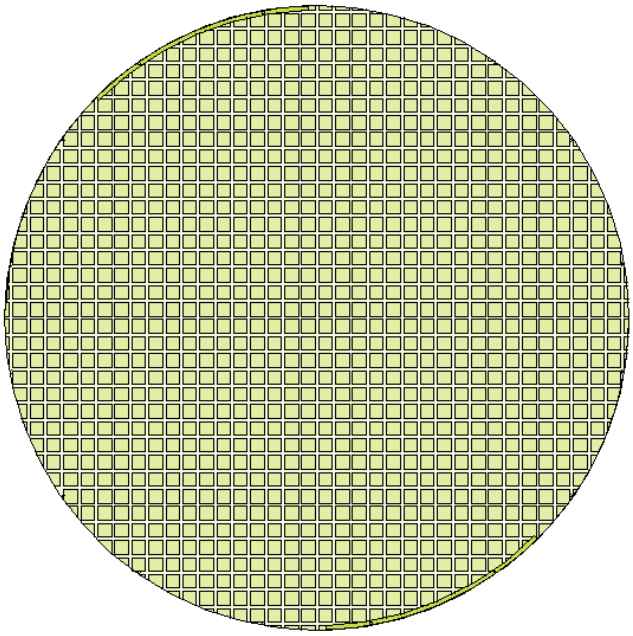
Polish Head Pad Adapters. These adapters are specially engineered to provide proper polishing. They mount onto the polishing head fixture used for the Quick Change Templates.

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

QUICK CHANGE HOLDER: FOR 36.25" DIA. PLATEN



Top View



Bottom View

The Quick Change Holder is part of the Quick Change Family of products.

This Quick Change Holder is designed for a specific platen size. It is glued onto the platen and is designed to be a permanent fixture. The shallow grooves on the bottom of the thick piece of G-10 material act to insure that no air is trapped under the holder. Both sides are lapped flat and parallel to insure the best performance. This holder allows for rapid change between pads types for polishing or when used with the platen templates, for rapid change of templates. This is ideal for laboratories, development tools, universities as well as short run operations that may require several different polish pad applications or just to reduce downtime. It has also been successfully deployed for use on large wafers, up to 450mm on small platen tools when used with ZeroMicrons S3 technology.

This Catalog Item defines the configuration and features of this Quick Change Pad (# TBD)

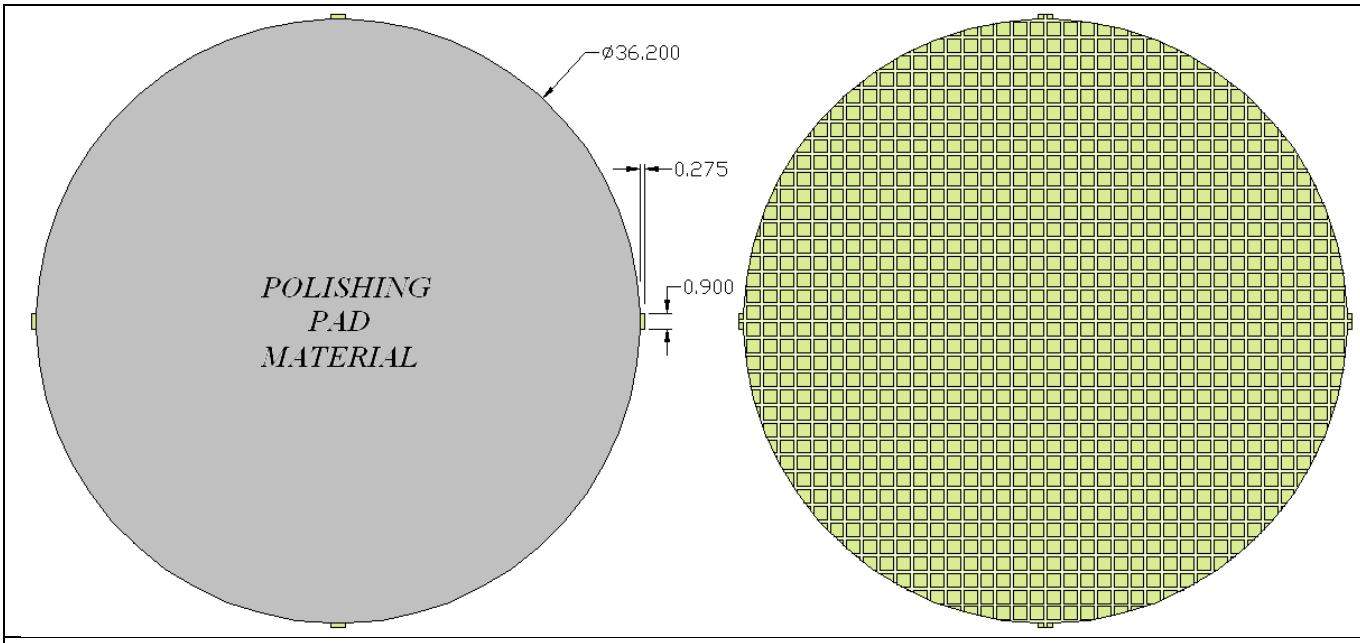
Platen size:	36.25 inch (920.75 mm)*
Material:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
Design features:	Locking tabs are provided to mate with the Quick Change Carrier.
	Bottom surface has air release pattern to for mounting without air bubbles
Application:	The Quick Change Holder is mounted onto the platen. Quick Change Polishing Pad Carriers or Platen Templates can then be mounted on the holder. These carriers and templates are simply inserted into the permanently mounted Quick Change Holder. . These changes typically require less than one minute.

* Custom sizes are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

QUICK CHANGE POLISHING PAD CARRIER: FOR 36.25" DIA. PLATEN



Top View | Bottom View

The Quick Change Pad Polishing Carrier is part of the Quick Change Family of products.

This Quick Change Polishing Pad Carrier is designed for a specific platen size. It is placed on the Quick Change Holder and locked in place with the four mounting tabs. No glue is required and the pad can be easily removed within one minute. This allows for rapid change between pads types without destroying the pad being removed. This is ideal for laboratories, development tools, universities as well as short run operations that may require several different polish pad applications or just to reduce downtime.

This Catalog Item defines the configuration and features of this Quick Change Pad (# TBD)

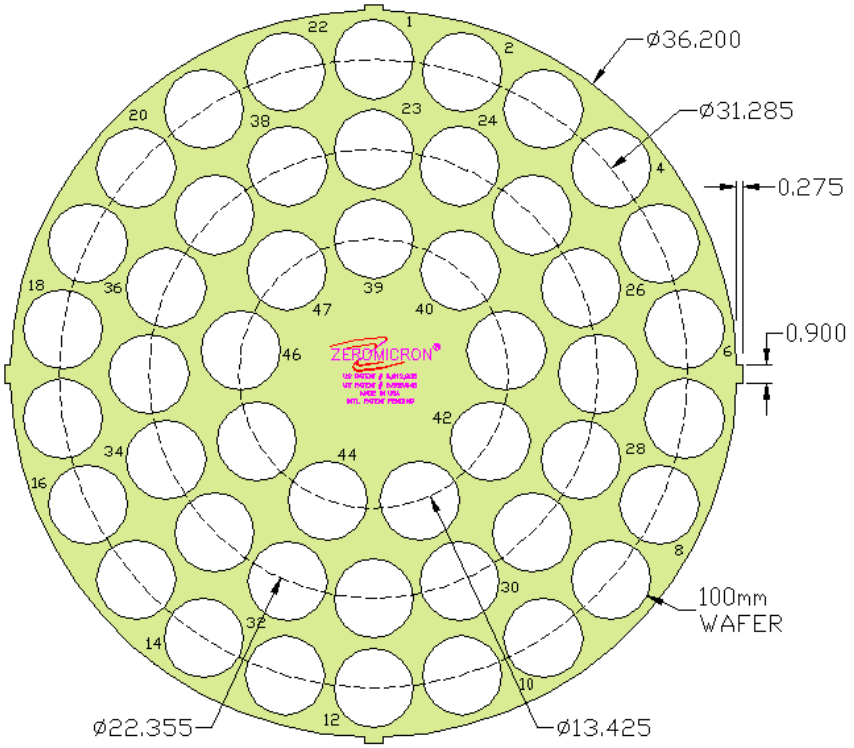
Platen size:	36.25 inch (920.75 mm)*
Material:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
Design features:	Locking tabs are provided to mate with the Quick Change Carrier.
	Bottom surface has air release pattern to for mounting without air bubbles
Application:	The polishing pad material is applied to the frame of the Quick Change Polishing Pad Carrier. This assembly is simply inserted into the permanently mounted Quick Change Holder. When the pad needs replacement, the old pad is simply removed and a new pad inserted. This requires less than one minute. The pad can now be replaced on the frame off-line. Pad replacements do not impact production and if pad types need to be changed, there is no reason to destroy the old pad in the removal process.

* Custom sizes are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PLATEN TEMPLATE: 36.25" DIA. – 100mm WAFER – 47 POCKETS



Diameter = 36.200 inches
(Tab OD = 36.750)

Wafer Size = 100mm
("4 inch")

Number of Pockets = 47

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System, Platen Quick Change Carrier and Polish Head Pad Adapter.

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

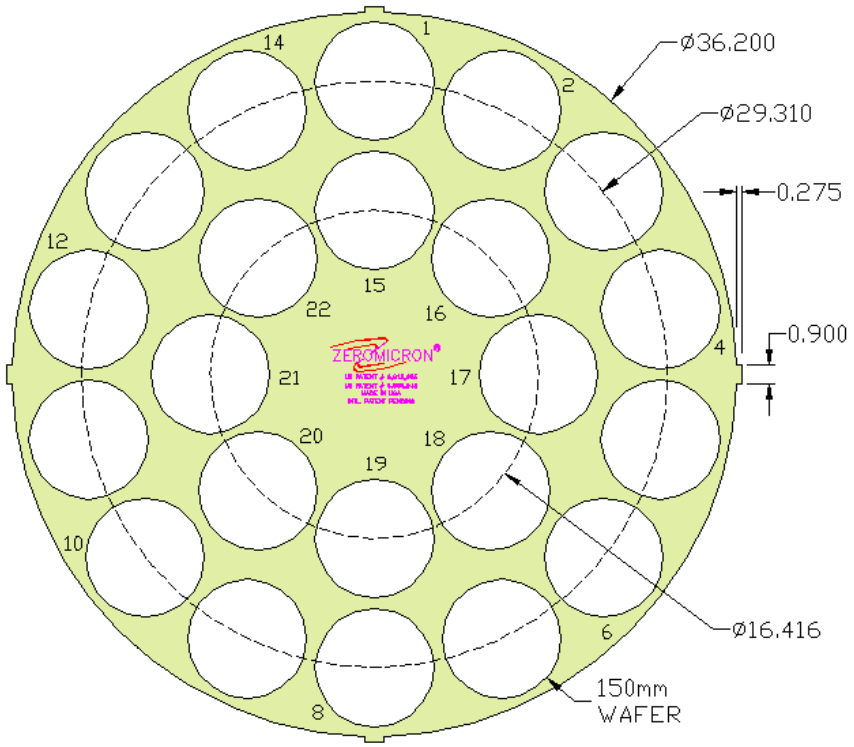
Platen size:	36.250 inch (920.8 mm)*
Head size:	13.250 inch to 14.750 inch (336.5 mm to 374.7 mm) recommended
Wafer size:	100 mm ("4 inch")* (pockets have engraved numbers)
Wafer pocket range:	100.2 mm to 101.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3) or the one piece insert ShimSert System. This Platen Template requires the ZeroMicron Polish Head Pad Adapter.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PLATEN TEMPLATE: 36.25" DIA. – 150mm WAFER – 22 POCKETS



Diameter = 36.200 inches
(Tab OD = 36.750)

Wafer Size = 150mm
("6 inch")

Number of Pockets = 22

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System, Platen Quick Change Carrier and Polish Head Pad Adapter.

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

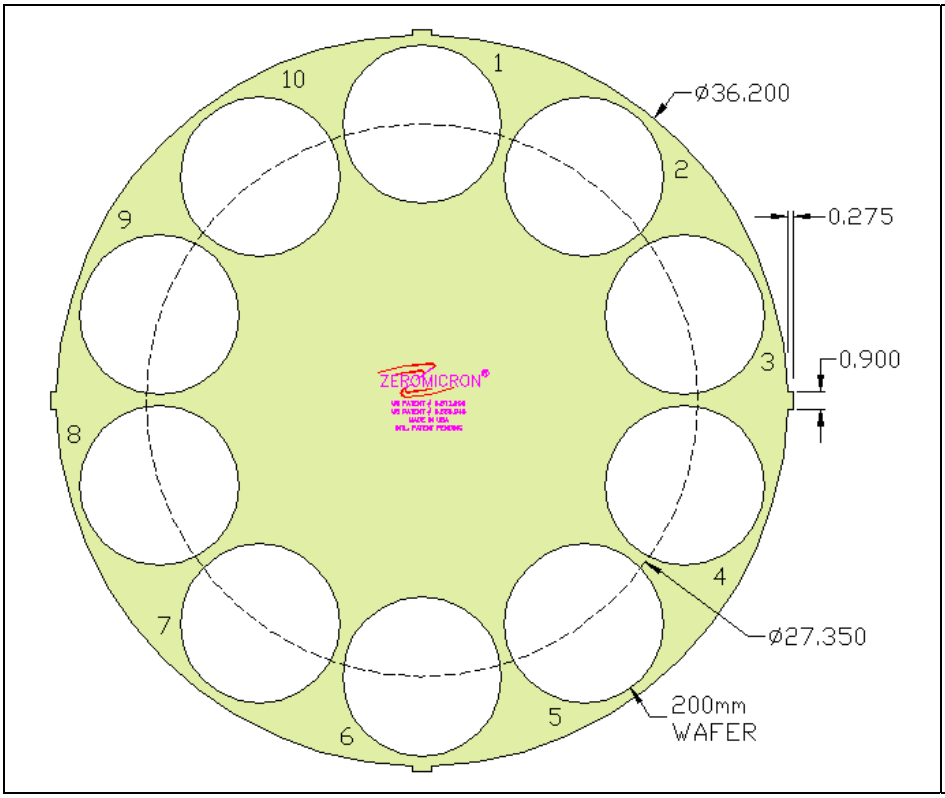
Platen size:	36.250 inch (920.8 mm)*
Head size:	13.250 inch to 14.750 inch (336.5 mm to 374.7 mm) recommended
Wafer size:	150 mm ("6 inch")* (pockets have engraved numbers)
Wafer pocket range:	150.2 mm to 151.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3) or the one piece insert ShimSert System. This Platen Template requires the ZeroMicron Polish Head Pad Adapter.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PLATEN TEMPLATE: 36.25" DIA. – 200mm WAFER – 10 POCKETS



Diameter = 36.200 inches
(Tab OD = 36.750)

Wafer Size = 200mm
("8 inch")

Number of Pockets = 10

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System, Platen Quick Change Carrier and Polish Head Pad Adapter.

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

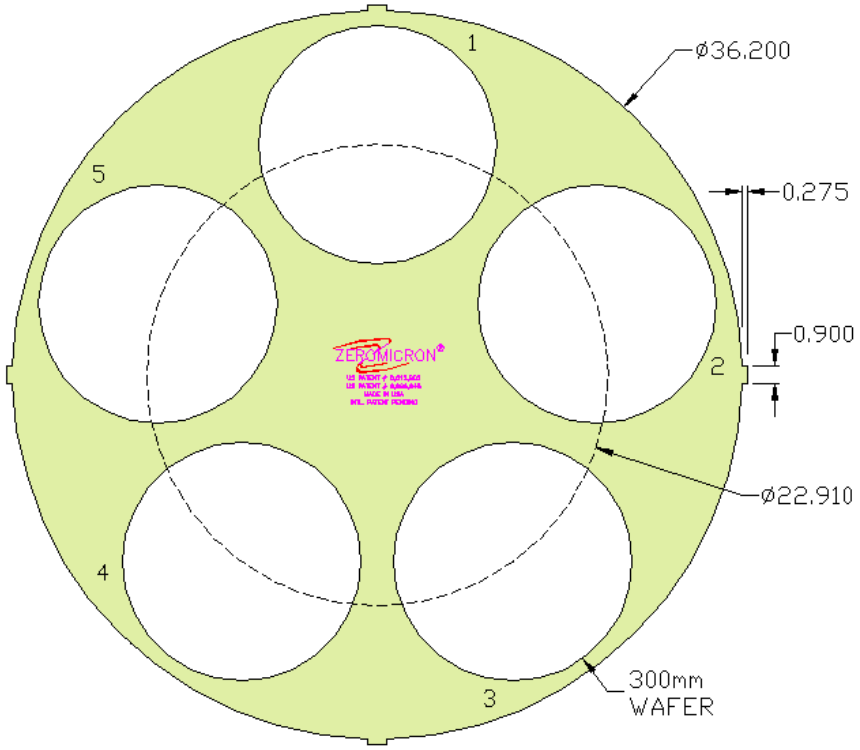
Platen size:	36.250 inch (920.8 mm)*
Head size:	13.250 inch to 14.750 inch (336.5 mm to 374.7 mm) recommended
Wafer size:	200 mm ("8 inch")* (pockets have engraved numbers)
Wafer pocket range:	200.2 mm to 201.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3) or the one piece insert ShimSert System. This Platen Template requires the ZeroMicron Polish Head Pad Adapter.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

PLATEN TEMPLATE: 36.250" DIA. – 300mm WAFER – 5 POCKETS



Diameter = 36.200 inches
(Tab OD = 36.750)

Wafer Size = 300mm
("12 inch")

Number of Pockets = 5

Features:

This template is constructed of rugged G-10 epoxy-fiberglass laminate material.

This template uses the ZeroMicron patented Shim Spinning System, Platen Quick Change Carrier and Polish Head Pad Adapter.

This Catalog Item defines the configuration and features of this Template Frame (#TBD).
ZM part #'s are assigned to define the full Template Assembly with the required pocket size & depth.

Platen size:	36.250 inch (920.8 mm)*
Head size:	13.250 inch to 14.750 inch (336.5 mm to 374.7 mm) recommended
Wafer size:	300 mm ("12 inch")* (pockets have engraved numbers)
Wafer pocket range:	300.2 mm to 301.2 mm* (customized to exact application specification)
Wafer thickness:	125 um to greater than 2 mm*
Design features:	Constructed of rugged G-10 epoxy-fiberglass laminate. High temperature G-11 material is available on special order.
	These templates can be configured to specified client pocket depth in 25um increments to accommodate virtually any thickness material.
	All template in this Frame format allow the wafer to rotate as it is polished to reduce taper, provide improved TTV and a better surface finish.
Application:	This template is designed for use with the ZeroMicron patented adjustable Shim Spinning System (S3) or the one piece insert ShimSert System. This Platen Template requires the ZeroMicron Polish Head Pad Adapter.

* Custom sizes, shapes and thickness capabilities are available on request.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

Technical Papers

Following is a collection of Technical Papers that have been generated to address specific issues. We hope that you find these helpful and interesting.

If you have an issue that you would like to see addressed, please contact us and discuss the problem or area of interest and, if practical, we will generate a technical paper to address that issue.

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

THE WORLDS TOUGHEST POLISHING TEMPLATES

The secret of ZeroMicron's (ZM's) lowest cost per wafer template is that we build a template that has a very long life under adverse conditions.

The first secret is to select adhesives specifically for the materials being bonded. ZM's program of constant improvement obtains adhesives from multiple manufacturers and selects the best for use in our template manufacturing process.

The competitors simply bond a piece of FR-4 material to a PET (PolyEthylene Terephthalate) backed piece of poromeric material, which, by definition, is porous and serves to hold the wafer in the pocket (Figure 1). ZM bonds the template frame, made of G-10 or rugged G-11 material directly to a thick sheet of clear PET film to form a strong and lasting assembly. Then ZM may insert a transparent spacer made of PET and pressure bonds it in the wafer pocket to the backing PET film.

This spacer is used for three purposes. First, it elevates the wafer away from the weakest point, the adhesive bond between the G-10 and the backing material. And, more important, it serves to adjust the pocket depth. FR-4/G-10 material is notorious for thickness variations. ZM adjusts the depth of every pocket to insure that you have the proper pocket depth for your application (Figure 2).

The third purpose has to do with the transparency of the spacer and the clear base material. With the other template manufacturers products it is impossible to see any air bubbles that might be trapped under the template. When air bubbles are located they need to be deflated to flatten them but this process results in minor distortions in the template surface. With the transparent ZM pocket, the ZM template can be mounted without introducing air bubbles.

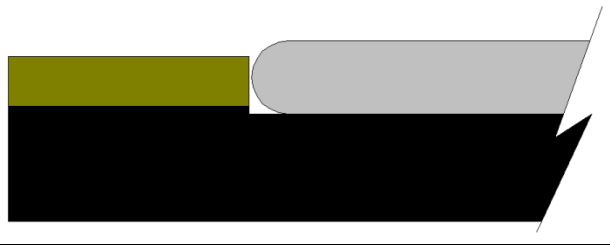


Figure 1
"Competitor" Template Partial Cross-Section

Figure 2
ZeroMicron Template Partial Cross-Section

Wafer	Poromeric Material	FR-4 / G-10	PET Shim	Clear PET

This assembly of the backing sheet, frame and pocket depth spacer form the template assembly but the rugged design does not stop there. After mounting a shim is inserted into the template pocket and a PET backed poromeric insert is placed on top of that. This PET-to-PET, PET-to-PET and poromeric-to-wafer construction is referred to as our Shim Spinning System (S^3) and allows the wafer to rotate in the pocket.

The S3 patented technology allows the ZM template to provide a more even finish with lower Bow and Warp measurements and a shorter time to polish which means lower TTV conditions. However, there is another advantage in that this system allows for greater poromeric compression.

Poromeric compression has little effect on the performance except that the wafer protrusion is compromised. Other templates require replacement of the template once the poromeric material is compressed which requires the purchase of a new template and the removal and replacement of the template on the polishing head. The ZM template only requires the replacement of the shim with a thicker shim. Typically this can be done twice before the poromeric insert needs to be replaced.

Clients have reported replacing the poromeric material eight to ten times without replacing the template. By using multiple shims to extend the poromeric insert life and replacing the insert, this equates to more than sixteen of the other manufacturers templates. Sixteen times that the template does not have to be removed. Actually, the ZeroMicron template should not be considered a consumable but rather it is a short term investment.

Now let's take a moment to examine the typical failure modes of the templates. There are four failure modes; 1) blowout, 2) template separation, 3) backside staining and 4) worn out pockets. From client reports we can state that ZM templates report a 75 to 80% reduction in blowouts. With other templates, a blowout requires replacement of the template. The ZM template normally only requires replacement of the poromeric insert resulting in a large time and expense savings.

An examination of Figures 1 and 2 helps explain how the other manufacturers' templates separate while the ZM template does not have this problem. The bond between the poromeric material, a porous structure, and the FR-4 frame is very weak. Further, the FR-4 material is rather thin and flexible. If the wafer starts to wear at that glue layer, the template will delaminate. The ZM template, by comparison (Figure 3) uses a very thick and rigid frame of G-10 or on special request, G-11 material. And, the ZM construction keeps the wafer away from the glue layers.

Backside staining occurs when the poromeric material becomes contaminated with a buildup of slurry. This is normally addressed by scrubbing the material and rinsing. With other templates, vigorous scrubbing can lead to early delamination and it is difficult to get into the edges of the pocket. With the ZM design, the poromeric inserts can be removed and scrubbed or replaced, further extending the life of the template.

The last failure mode is when the wafer pocket wears out. Over many runs the edge of the pocket will start to wear. As this wear continues it will round the edge of the pocket off and the wafer will slip out of the pocket. A close look at Figures 1 and 2 will show that other manufacturers try to run their wafers at a 30% exposure. This puts the apex of the wafer edge very close to the upper edge of the FR-4 material. This is done to obtain the maximum life from the template as the poromeric material is compressed but also acts to weaken the template and cause early failures.

With the ZM template, this is not a concern as the depth can be adjusted for poromeric compression. We strongly recommend a 20% protrusion. This means that the wafer edge apex is located deeper in the pocket and takes substantially longer to wear sufficiently to require replacement.

- ✓ **Rugged design**
- ✓ **Longer life**
- ✓ **Better performance**
- ✓ **Lower costs**

Contact: ZeroMicron Inc. 2330 South Tenth Street San Jose, CA 95112-4109 Tel: 1-408-441-4600 / Fax: 1-408-441-9404 Email: info@zeromicron.com	

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

LOW COST, HIGH PERFORMANCE TEMPLATES

ZeroMicron has introduced a new design for an old product that we call the New Classic. This is a one piece template for single-sided waxless wafer polishing. But … this one comes with a difference.

The first difference is a selection of adhesives specifically for the materials being bonded. ZM's program of constant improvement obtains adhesives from multiple manufacturers and selects the best for use in our template manufacturing process.

The competitors simply bond a piece of FR-4 material to a PET (PolyEthylene Terephthalate) backed piece of poromeric material. Unfortunately the bond is on the face of the poromeric material which, by definition, is porous and serves to hold the wafer in the pocket (Figure 1). However, this forms a very weak bond between the materials. ZM bonds the template frame, made of G-10 or rugged G-11 material directly to a thick sheet of clear PET film to form a strong and lasting assembly (Figure 2). Then ZM may insert a transparent spacer made of PET and pressure bonds it in the wafer pocket to the backing PET film.

This spacer serves to adjust the pocket depth. FR-4/G-10 material is notorious for thickness variations. ZM adjusts the depth of every pocket to insure that you have the proper pocket depth for your application.

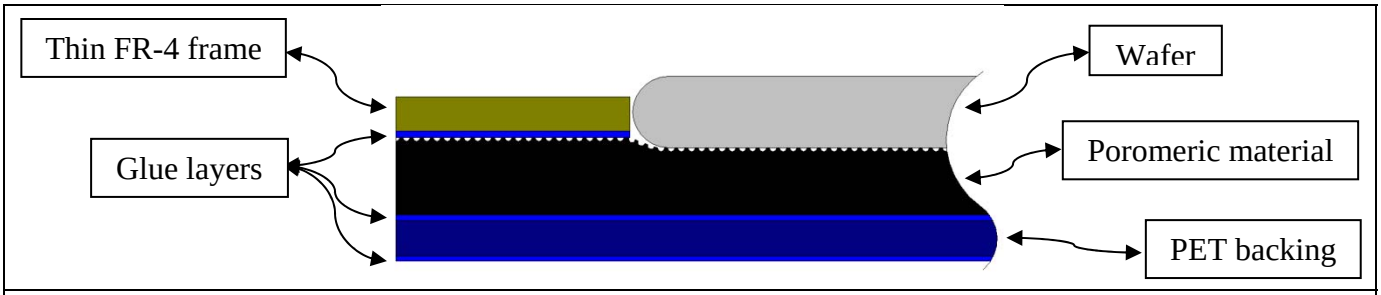


Figure 1 - "Competitor" Template Partial Cross-Section

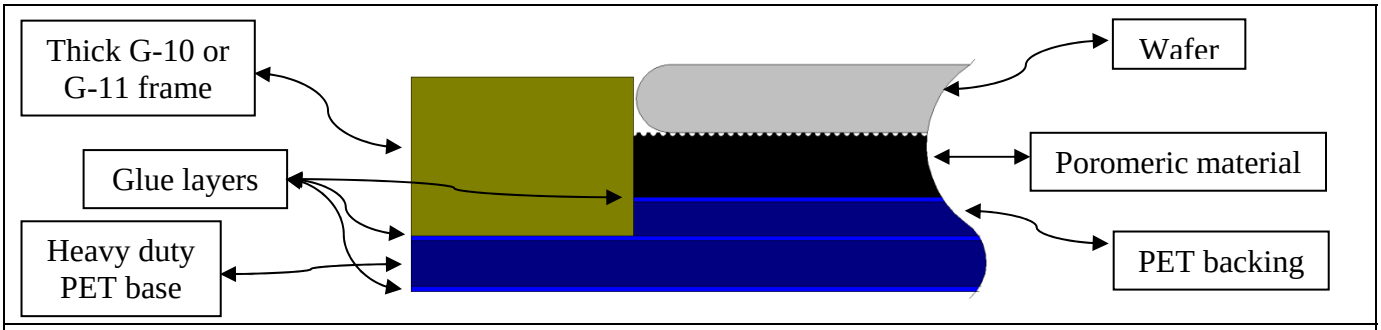


Figure 2 - ZeroMicron Template Partial Cross-Section

While this assembly lacks the features of the more advanced ZeroMicron Shim Spinning System, it eliminates the handling of the loose shim and poromeric insert but retains the more rugged construction features that give the template a longer service life.

This template is available in two formats, with a loose poromeric insert and a fixed poromeric insert. The loose insert allows the user to remove and replace the insert on their production line. This also allows the user to remove and scrub the insert material to prevent backside staining. A thorough scrubbing of the poromeric material is recommended. However, on templates where the FR-4 material is bonded directly to the poromeric material, this can actually weaken the edge of that bond, a condition that does not occur on the ZM product due to the more robust design.

On the ZeroMicron template using the loose poromeric insert ZM warns that the inserts should be maintained in a set to insure that proper wafer protrusion is maintained. All inserts in a set should be within a one mil thickness of each other.

On the ZeroMicron template with fixed poromeric inserts, care should be taken in the removal of the template if it is being returned to ZM for insert replacement. The template material cannot be folded, stretched or distorted. Templates with worn pocket edges are considered to have exceeded their useful life. Alternatively, ZM offers the option of replacing the inserts on the polishing head. A complete set of written instructions are available along with an instructional video.

Now let's take a moment to examine the typical failure modes of the templates. There are four failure modes; 1) blowout (Figure 3), 2) template separation (Figure 4), 3) backside staining and 4) worn out pockets. From client reports we can state that ZM templates report a 75 to 80% reduction in blowouts with many blowouts occurring early in the template life. Other templates are designed to have a 30 to 35% wafer protrusion. This puts the apex of the wafer edge curve very close to the upper lip of the wafer pocket. ZM uses a design of 20 to 25% or 15 to 20% for thin wafers due to their greater potential flexibility.

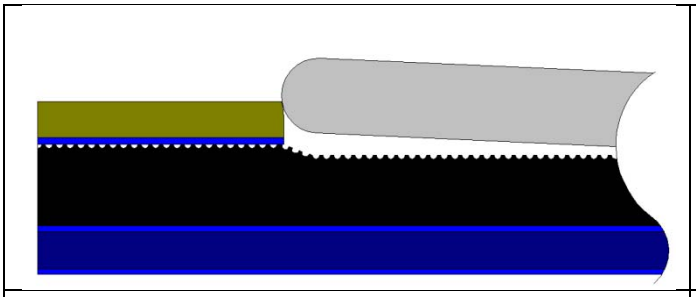


Figure 3 - Blowout Failure

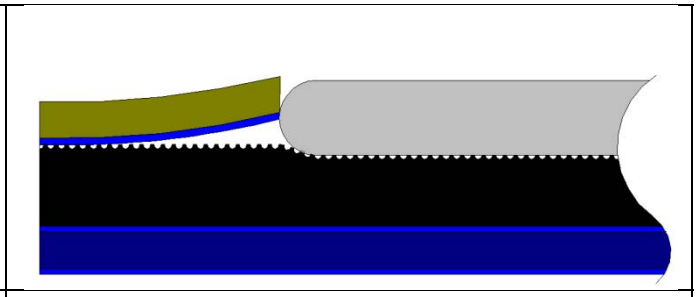


Figure 4 - Delamination Failure

When a blowout occurs the poromeric material is typically destroyed. In templates where the entire base is a single sheet of this material, the entire template is destroyed. However, the ZM template normally only requires replacement of the poromeric insert resulting in a large time and expense savings.

Template separation is not a problem due to the construction of the ZM template as explained previously. Backside staining is also greatly reduced because the construction allows for vigorous bing and cleaning. And, with the thicker frame material, the ZM template can withstand more wear. If extended wear is required, the G-10 material can be replaced with a harder G-11 material.

- ✓ **Rugged design**
- ✓ **Longer life**
- ✓ **Better performance**
- ✓ **Lower costs**

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: (408) 441-4600 / Fax: (408) 441-9404
Email: info@zeromicron.com

2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600
Fax: 1-408-441-9404
info@zeromicron.com
www.zeromicron.com

LOWEST COST PER WAFER
WAFER POLISHING TEMPLATES

ZeroMicron delivers the wafer polishing template with the lowest cost per wafer in the industry.

- A better than 50% cost reduction based on multiple client results. (See cost comparison on backside of this paper).
- Some reported savings as high as 80%.

And, this low cost polishing template delivers the best results in terms of surface finish, flatness, taper, haze and TTV

Condition	Competition	ZeroMicron
Total Thickness Variation (TTV)	More than 7µm	Less than 2µm
Site Flatness	Wedge surface	Parallel surface
Haze	More than 5%	Less than 1%
Backside Stain	10%	None

Advantages of the ZeroMicron template:

- ✓ Fewer blowouts. Most blowouts only require the replacement of the poromeric insert, not the template. This saves both time and money.
- ✓ Adjustable thickness. An insert is used in the bottom on the polishing pocket to adjust height and is replaceable with a selection of thickness for production. No need to stock multiple templates.
- ✓ Shim Spinning System ($S^{3)}$. The removable shim and poromeric insert allows the wafer to spin in the pocket for more even finish and faster removal rate.
- ✓ Faster removal rates. Design allows higher pressures and temperatures with patented S^3 technology for higher removal rates.
- ✓ Rugged design. Template frames are bonded to rigid materials, poromeric materials are replaceable and the wafer is elevated above the base glueline.

ZeroMicron can provide advanced designs for faster processing, improved surface finishes, difficult materials like Silicon Carbide, Sapphire or Germanium.

Two Examples of Cost Comparisons Based on Client Results:

Example 1.

Four head polisher, five pocket template (20 wafers per run)

Item	Competitor	ZeroMicron
Average # of runs / template set	100	1000
Cost of template set	$300.00	$600.00
Cost of shim and insert set	$0.00	$285.00
20,000 wafer run		
Total cost of templates	$3,000.00	$600.00
Total cost of shim & insert sets (3 sets)	$0.00	$855.00
Total costs	$3,000.00	$1,455.00
Cost Per Wafer	**$0.150**	**$0.073**

Additional benefits cited by the client:

- ✓ Decreased run time from 20 minutes to 15 minutes, 25% thru-put increase.
- ✓ Decreased blowouts from 11 to 2.
- ✓ Each blowout required replacement of the competitor template plus 15 minute replacement time. On ZeroMicro templates, simply replace the insert.
- ✓ Decreased template replacement time.

Example 2.

Four head polisher, three pocket template (12 wafers per run)

Item	Competitor	ZeroMicron
Average # of runs / template set	130	1250
Cost of template set	$300.00	$600.00
Cost of shim and insert set	$0.00	$276.72
One month, six day, two shift run (24,960 minutes)		
Run time (Start run to Start run time)	32 min.	27 min.
Total template set run time	4,160 min	33,750 min.
Total template run time	4,160 min	24,960 min.
Total # of runs	780	925
Total # of blowouts	13	2
Cost per blowout	$75.00	$20.70
Shim & insert sets (350 runs per set)	0	2.64
Template sets required	6	0.74
Total costs	$2,775.00	$1,215.94
Wafers processed	9,360	11,088
Cost Per Wafer	**$0.296**	**$0.110**

Note: Run time was based on start-to-start time. Downtime and loss for blowouts not included.

Contact: ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112-4109
Tel: 1-408-441-4600 / Fax: 1-408-441-9404
Email: info@zeromicron.com

Terms and Tables

Following is a collection of terms and terminology commonly used in the lapping and polishing industry.

A table of common conversions is also included due to a tendency within the industry to speak in units of millimeters and inches, mils and microns, Angstroms and nanometers all at the same time.

The terms and tables will be updated as needed and if you feel that there are terms or conversions that should be added, please let us know at info@zeromicron.com.

How Semiconductors are Made

The process of manufacturing semiconductors, or integrated circuits (commonly called ICs, or chips) typically consists of more than a hundred steps, during which hundreds of copies of an integrated circuit are formed on a single wafer.

Generally, the process involves the creation of eight to hundreds of patterned layers on and into the substrate, ultimately forming the complete integrated circuit. This layering process creates electrically active regions in and on the semiconductor wafer surface.

Wafer Production

The first step in semiconductor manufacturing begins with production of a wafer - a thin, round slice of a semiconductor material, usually silicon.

In this process, purified polycrystalline silicon, created from sand, is heated to a molten liquid. A small piece of solid silicon (seed) is placed on the molten liquid, and as the seed is slowly rotated and pulled from the melt the liquid cools to form a single crystal ingot. The surface tension between the seed and molten silicon causes a small amount of the liquid to rise with the seed and cool.

The crystal ingot is then ground or turned to a uniform diameter. Any required orientation flats or notches are machined in and a diamond saw cuts the ingot into thin wafers.

The wafer is processed through a series of machines, where it is ground smooth and chemically polished to a mirror-like luster. The first step is to lap the part flat. This step removes the scratches from the sawing process and produces an extremely flat surface. The next step is to polish the surface and remove the minor scratches from the lapping process. This is referred to as rough polish and is designed to rapidly remove material to prepare the surface for a final polish step that brings it to the mirror-like luster.

Unfortunately, polishing introduces some inconsistencies to the surface flatness and long polishing processes introduce surface waviness resulting in excessive bow, warp, flatness and TTV (Total Thickness Variation).

The wafers are then ready to be sent to the wafer fabrication area where they are used as the starting material for manufacturing integrated circuits.

Wafer Fabrication

The heart of semiconductor manufacturing is the wafer fabrication facility where the integrated circuit is formed in and on the wafer. The fabrication process, which takes place in a clean room, involves a series of principle steps described below. Typically it takes from 10 to 30 days to complete the fabrication process.

Thermal Oxidation or Deposition

Wafers are pre-cleaned using high purity, low particle chemicals (important for high-yield products). The silicon wafers are heated and exposed to ultra-pure oxygen in the diffusion furnaces under carefully controlled conditions forming a silicon dioxide film of uniform thickness on the surface of the wafer.

Masking

Masking is used to protect one area of the wafer while working on another. This process is referred to as photolithography or photo-masking.

A photoresist or light-sensitive film is applied to the wafer, giving it characteristics similar to a piece of photographic paper. A photo aligner aligns the wafer to a mask and then projects an intense light through the mask and through a series of reducing lenses, exposing the photoresist with the mask pattern.

Precise alignment of the wafer to the mask prior to exposure is critical. Most alignment tools are fully automatic.

Etching

The wafer is then "developed" (the exposed photoresist is removed) and baked to harden the remaining photoresist pattern. It is then exposed to a chemical solution or plasma (gas discharge) so that areas not covered by the hardened photoresist are etched away.

The photoresist is removed using additional chemicals or plasma and the wafer is inspected to ensure the image transfer from the mask to the top layer is correct.

Doping

Atoms with one less electron than silicon (such as boron), or one more electron than silicon (such as phosphorous), are introduced into the area exposed by the etch process to alter the electrical character of the silicon. These areas are called P-type (boron) or N-type (phosphorous) to reflect their conducting characteristics.

Repeating the Steps

The thermal oxidation, masking, etching and doping steps are repeated many times until the last "front end" layer is completed (all active devices have been formed).

Dielectric Deposition and Metallization

Following completion of the "front end," the individual devices are interconnected using a series of metal depositions and patterning steps of dielectric films (insulators).

Current semiconductor fabrication includes many metal layers separated by dielectric layers.

Passivation

After the last metal layer is patterned, a final dielectric layer (passivation) is deposited to protect the circuit from damage and contamination. Openings are etched in this film to allow access to the top layer of metal by electrical probes and wire bonds.

Electrical Test

An automatic, computer-driven electrical test system then checks the functionality of each chip on the wafer. Chips that do not pass the test are marked with ink for rejection.

Assembly

A diamond saw typically slices the wafer into single chips. The inked chips are discarded, and the remaining chips are visually inspected under a microscope before packaging.

The chip is then assembled into a package that provides the contact leads for the chip. A wire-bonding machine then attaches wires, a fraction of the width of a human hair, to the leads of the package. Encapsulated with a plastic coating for protection, the chip is tested again prior to delivery to the customer. Alternatively, the chip is assembled in a ceramic package for certain military applications.

Terms and Terminology

A

acceptor
An impurity from column III of the periodic table, which adds a mobile hole to silicon, thereby making it more P-type and accepting of electrons. Boron is the primary acceptor used to dope silicon. Compare donor.

aligner
A processing tool used to transfer lithographic patterns from a photomask to a silicon wafer. Four types of aligners are commonly used: contact, proximity, projection, and steppers.

Ångstrom
A unit of length. 10,000 Ångstroms equals 1 micron. 10^8 Ångstroms equals 1 cm. A silicon atom has a lattice spacing of 5.43 Ångstroms. Symbol: Å.

ASP
Average **S**elling **P**rice.

assembly
A group of parts that are joined together to form a functional unit.

average roughness (Ra)
Ra is calculated by an algorithm that measures the average length between the peaks and valleys and the deviation from the mean line of the sampling length. Ra averages all peaks and valleys of the roughness profile and then neutralizes the few outlying points so that the extreme points have no significant impact on the final results. It's a simple and effective method for monitoring surface texture and ensuring consistency in measurement of multiple surfaces. Care must be taken in selection of the method to insure that the measurement instrument has a spatial resolution to achieve the desired accuracy.

B

back end
In semiconductor manufacturing, the package assembly and test stages of production. Includes burn-in and environmental test functions.

backside stain
A stain on the backside of the wafer caused by contamination, typically polishing slurry, that has not been fully cleaned out of the template pocket. This is a major problem on some materials such as Germanium and on templates with the poromeric material mounted in the bottom of the pocket. See pocket scrubbing.

barrier layer
A film layer that creates a blockade.

bipolar transistor
An active semiconductor device formed by two P-N junctions whose function is amplification of an electric current. Bipolar transistors are of two types: NPN and PNP, depending on the manner in which the two P-N junctions are combined. Bipolar transistors have three sections: emitter, base, and collector. Operation of a bipolar transistor depends on the migration of both electrons and holes, in contrast to field-effect transistors, where only one polarity carrier predominates.

BIR
Building In Reliability.

bit
Binary digit. A digit (1 or 0) in the representation of a number in binary notation. The smallest unit of information recognized by a digital computer. Used to represent two states in the binary number system. Eight bits make a byte.

blow out
A condition in wafer polishing where the wafer is pushed out of the pocket with catastrophic results. Usually caused by excessive protrusion or worn polishing template pockets.

BOM
Bill of Materials. Also referred to as List of Materials. A list of specifications that uniquely defines manufacturing sequence, materials and procedures utilized in the manufacture of a specific product.

bonded wafer
A composite dielectrically isolated substrate formed by fusing together (at high temperature) the oxidized surfaces of two individual silicon substrates. Bonded wafers are being developed to extend DI (dielectric isolation) technology to wafers, an insulating layer of silicon dioxide. ICs formed in such wafers provide higher breakdown voltage and a higher level of radiation resistance than devices fabricated in conventional DI substrates.

bonding
The process of connecting wires from the package leads to the chip (or die) bonding pads. Part of the assembly process. Alternately, the process of securing a semiconductor die to a lead frame or package.

bond pad
An area (typically 100µm x 100µm) on the periphery of a silicon die for making connection to one of the package pins. A small-diameter gold or aluminum wire is bonded to the pad area by a combination of heat and ultrasonic energy.

boule
See Czochralski, ingot or wafer

bow
The deviation of the center point of the median surface of a free, un-clamped wafer from the median surface reference plane established by three points equally spaced on a circle with a diameter a specified amount less than the nominal diameter of the wafer. When bow is specified, a sign may be included in the specification to denote convex (positive) or concave (negative) curvature of the median surface of the wafer with the front surface up. If no sign is included in the specification, bow may vary between -*a* and +*a*, where *"a"* is the specified maximum magnitude of bow.

BPSG
BoroPhosphoSilicate Glass. BPSG is an oxide primarily used as a field dielectric. It is deposited in a PECVD reactor using a mixture of SiH_4, B_2H_6, and PH_3 with N_2O in a temperature and pressure controlled environment. BPSG is used principally because of its' lower melting point (viscous flow temperature) compared to other oxides. BPSG can be deposited over delineated polysilicon and can 'flow' at temperatures low enough to not significantly alter the dopant profiles in the underlying device silicon. This smoothing improves metal-level step coverage. BPSG is not a good passivation material because it is hydroscopic in nature.

buffer
A solution characterized by the ability to withstand changes in pH when limited amounts an acid or base are added.

byte
From the expression "by eights." A group of eight contiguous bits (binary digits) handled as a unit in computer processing. A byte can store one alphanumeric character. A kilobyte (KB) is 1024 bytes or 8192 bits. A megabyte (MB) is 1024 kilobytes or 1,048,576 bytes or 8,388,608 bits.

C

CAD
Computer-Aided Design. The use of computer aids (hardware and software) in the electrical and physical design and verification of new things. Historically, CAD has been more used to describe the physical design rather than the electrical design, although currently the distinction is so blurry as to be meaningless.

CAE
Computer-Aided Engineering. Traditionally, CAE has been used to describe the electrical design rather than the physical design, although these distinctions have blurred.

CAM
Computer-Aided Manufacturing. The use of computer aids (hardware and software) in planning the construction, tracking the construction, analyzing, and implementing the construction of manufactured things.

CD
Critical Dimension. A feature size typically the minimum size line width on a device but can also define wafer diameter and thickness, kerf width or any dimension critical to the manufacturing process.

characterization parameter
A characterization parameter is a measurement taken on a process, tool, or product during a process or product characterization and at infrequent intervals thereafter.

Chemical Introducing Groove
See CIG

chip
Also called a die. Popular term describing a section of a wafer that contains a discrete component or an integrated circuit. Many chips are made on a single wafer, then separated into dice and packaged individually.

chip carrier
A low-profile component package, usually square, whose active chip cavity or mounting area is a large fraction of the package size, and whose external connections are usually on all four sides of the package.

CIG
Chemical Introducing Groove is a ZeroMicron developed and patented process where grooves are machined into the surface of a polishing template to direct a heavier flow of liquid (slurry or rinse) onto the surface of the part being polished.

CIM
Computer-Integrated Manufacturing. The integration of computer control and monitoring into a manufacturing process.

clean room
A confined area in which the humidity, temperature, and particulate matter are precisely controlled within specified units. The "class" of the clean room defines the maximum number of particles of a defined size or larger that may exist in one cubic meter of space anywhere in the designated area.

ISO 14644-1 Cleanroom Standards

Class	maximum particles/m^3						FED STD 209E equivalent
	≥ 0.1 µm	≥ 0.2 µm	≥ 0.3 µm	≥ 0.5 µm	≥ 1 µm	≥ 5 µm	
ISO 1	10	2					
ISO 2	100	24	10	4			
ISO 3	1,000	237	102	35	8		Class 1
ISO 4	10,000	2,370	1,020	352	83		Class 10
ISO 5	100,000	23,700	10,200	3,520	832	29	Class 100
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293	Class 1,000
ISO 7				352,000	83,200	2,930	Class 10,000
ISO 8				3,520,000	832,000	29,300	Class 100,000
ISO 9				35,200,000	8,320,000	293,000	Room Air

CMP
Chemical-Mechanical Polish. A process of polishing wafers that utilizes both chemical removal and mechanical buffing. It is used during the fabrication process for planarization of the circuitry layers. It is a common misperception that CMP will flatten a wafer. Polishing is a conformal process and will serve to amplify any polishing pad, material or process inconsistencies. Long polish times have a tendency to increase bow, warp and TTV.

concurrent engineering
A parallel development approach for reducing time-to-market as well as improving the quality and market impact of new products. Concurrent teams are comprised of representatives from engineering, manufacturing, marketing, quality, etc., and make a special effort to involve the ultimate customer during product definition.

conductor
Any material, such as aluminum, copper or gold, that offers little resistance to the flow of electrical current. Conductors are still used on many trains to collect passengers tickets.

consortium
A combination or group of organizations formed to undertake a common objective that is beyond the resources or capabilities of any single organization. Plural: consortia. Industry consortia include such organizations as SRC, MCC, and SEMATECH.

contamination
The presence of unwanted particles, chemicals, or other substances. Major sources are oils from finger prints, cosmetics, skin particles and tool malfunctions.

contamination area
An area that contains particles or foreign materials of any type that can negatively affect the characteristics of a wafer or chip.

control parameter
A control parameter is a measurement taken for the purpose of controlling an in-line process or as a test on product.

core competencies
An area of unique strength or expertise. ZeroMicron uses the term to refer to capabilities, process technologies, or product types that provide the company with a competitive advantage.

critical dimension
Typically the minimum size line width on a circuit, pattern.

critical node
A critical node is a control parameter which impacts the reliability of a component on a given technology.

current
The flow of electrons or holes. Usually measured in amperes (amp or A) or in fractions of an ampere (milli-amps or micro-amps). Current can be induced by application of an electric field through a conductor or by changing the electric field across a capacitor (displacement current.)

customer satisfaction index
An objective measure of performance against customer expectations, as monitored through formal interviews with specific customers. Used by ZeroMicron to identify problem areas and correct deficiencies.

CVD
Chemical Vapor Deposition. A gaseous process that deposits insulating films or metal onto a wafer at elevated temperature. Often, reduced pressure is used to promote the chemical reaction.

Czochralski (CZ)
The Czochralski or CZ crystal growth technique is the most frequently used method for producing large single crystals of silicon (also germanium or gallium-arsenide). In the CZ method a cylindrical single crystal is pulled vertically from silicon melt in a heated crucible. The growth is initiated by dipping a small seed crystal in the melt, and after the thermal equilibrium is reached, the crystal is pulled upwards so that it grows with a constant diameter. At the same time, the crystal rod and the crucible are rotated in opposite directions. These crystal rods are cut into thin wafers and processed to be used in IC manufacturing. The rods are referred to as an ingot or boule.

D

defect
A chemical or structural irregularity that degrades the crystal structure of silicon or of the deposited materials that reside on its surface. Defects can be active mobile impurities that impact the electrical device characteristics over time, or inactive particulates that interfere with the photolithographic patterning. The most common defects in semiconductor processing are those originating from people (oil, cosmetics, sneezing, skin flakes, etc.)

defectivity
Any surface imperfection, scratch, dig, haze, contamination or defect (see above).

deposition
The procedure in which materials are deposited onto a substrate. Usually refers to thin conducting or insulating films used to form MOS gates, capacitors, thin-film resistors, and the interconnect system for an IC.

DFM
Design For Manufacturability utilizes statistical information on manufacturing process characteristics to ensure that the circuit design falls within the parameters of normal manufacturing variances for each process element. This allows the designer to center the design for maximum performance and enhances yields, thereby reducing cost.

DFR
Design For Reliability.

DFT
Design For Testability is a design technique and methodology that produces designs for which tests can be generated by known methods that will result in reduced test generation cost, reduced testing cost, and high-quality product.

DI
See dielectric isolation.

DI water
De-Ionized water is water that has had its mineral ions removed, such as cations like sodium, calcium, iron, and copper, and anions such as chloride and sulfate. Deionization is a chemical process that uses specially manufactured ion-exchange resins which exchange hydrogen ion and hydroxide ion for dissolved minerals, which then recombine to form water. Because the majority of water impurities are dissolved salts, deionization produces a high purity water that is generally similar to distilled water, and this process is quick and without scale buildup. However, deionization does not significantly remove uncharged organic molecules, viruses or bacteria, except by incidental trapping in the resin. Specially made strong base anion resins can remove Gram-negative bacteria.

Dielectric Isolated Complementary Metal Oxide Semiconductor. DICMOS devices have proved to be an excellent solution for applications requiring very low leakage current or over-voltage protection.

die
A single square or rectangular piece of semiconductor material into which a specific electrical circuit has been fabricated. Plural: dice. Also called a chip and can be referred to as site.

dielectric
An insulator. Localized regions of dielectric materials are used in semiconductor devices, for example, to provide electrical isolation between dice, between metal interconnect layers, and between the gate electrode and the channel.

dielectric isolation (DI)
A fabrication technique by which components in an integrated circuit are electrically isolated from each other by an insulator (dielectric material). DI surrounds the sides and bottom of each transistor with a layer of silicon dioxide (glass). DI has proven particularly advantageous for fabricating high performance analog ICs. The conventional DI fabrication process for bipolar ICs begins with a wafer of N-type silicon. The side of the wafer that will eventually be the bottom is deeply etched (in V-shaped grooves) to form the sidewall pattern, then silicon dioxide and polycrystalline silicon are grown to fill the etched moats and to thicken the eventual DI substrate. The opposite side of the wafer is polished until the insulating sidewalls appear at the wafer surface. Conventional diffusion and metallization processes follow to complete the IC..

diffusion
A high temperature process in which chemical impurities (dopants) enter and move through the crystalline lattice structure of a semiconductor material to change its electrical characteristics. The process takes place in a diffusion furnace, usually at temperatures between 850^{o}C and 1150^{o}C.

dig
A defect on a polished optical surface that is nearly equal in terms of its length and width. As implied by the name, the defect penetrates into the surface.

dimple
A concave depression found on the surface of a wafer that is visible to the eye under the correct lighting conditions.

diode
A two-terminal semiconductor (rectifying) device that exhibits a non-linear current-voltage characteristic. The function of a diode is to allow current in one direction and to block current in the opposite direction.

discrete device
A class of electronic components that typically contain one active element, such as a transistor or diode.

donor
An impurity from column V of the periodic table, which adds a mobile electron to the conduction band of silicon, thereby making it more N-type. Commonly used donors are arsenic and phosphorous. See acceptor.

doping
The intentional introduction of a selected chemical impurity (dopant) into the crystal structure of a semiconductor to modify its electrical properties. For example, adding boron to silicon makes the material more P-type. Doping concentrations range from a few parts per billion (for resistive semiconductor regions) to a fraction of a percent (for highly conductive regions). The material introduced is referred to as a “dopant”, not to be confused with “dope” that refers to individuals or certain plant materials.

down force
The amount of pressure applied to the wafer per unit area on the substrate. Typically in the lapping, polishing or planarization stages of the process.

DRC
Design Rule Check. DRCs measure spacing, overlap, and sizes of all dimensions on the layout of a part. This is necessary to ensure that the component dimensions will conform to the capabilities of the design purpose.

E

E-beam
Electron beam. Refers to a machine that produces a stream of electrons (electron beam) that can be used to expose photo-resists that are sensitive to such beams. Can be used to expose resists directly on a wafer or on a mask. Electron-beam lithography is a direct-write microprinting technique.

edge chip and indent
An edge imperfection that is greater than 0.25mm.

edge exclusion area
The area located between the fixed quality area and the periphery of a wafer. (This varies according to the dimensions of the wafer and the customer specification.) ZeroMicron has perfected techniques to extend the edge exclusion area to provide more usable wafer surface.

edge profile
The edges of a wafer that have been shaped either chemically or mechanically.

EDIF
Electronic Design Interchange Format. A standardized exchange language for design information.

electromigration
Motion of ions of a metal conductor (such as aluminum) in response to the passage of high current through it. Such motion can lead to the formation of "voids" in the conductor, which can grow to a size where the conductor is unable to pass current. Electromigration is aggravated at high temperature and high current density and therefore is a reliability "wear-out" process. Electromigration is minimized by limiting current densities and by adding metal impurities such as copper or titanium to the aluminum.

electron
An elementary atomic particle that carries the smallest negative electric charge ($1.6x10^{-19}$ coulombs). Electrons are light in mass, (1/1837 of the mass of the hydrogen atom), highly mobile, and orbit the nucleus of an atom.

ESD
ElectroStatic Discharge as its name implies is a static buildup of electrons that is then discharged. The magnitude of ESD can vary widely, but the duration of a pulse is usually very short. An ESD event can result in chip failure. The root cause of ESD typically is improper handling. This can be augmented by low humidity and ungrounded equipment.

epitaxy
The controlled growth on a crystalline substrate of a crystalline layer, called an epilayer. In "homo-epitaxy" (e.g., silicon layers on a silicon substrate) the epilayer exactly duplicates the properties and crystal structure of the substrate. In "hetero-epitaxy" (e.g., silicon on sapphire)

the deposited epilayer is a different material with a different crystalline structure than that of the substrate.

erosion
A selectivity problem where one material is removed at a faster rate than another on a device.

etch
The process of removing material from a wafer (such as oxides or other thin films) by chemical, electrolytic or plasma (ion bombardment) means. Examples: nitride etch, oxide etch. Not to be confused with Etch-A-Sketch which actually has no etching properties.

F

FA
Failure Analysis.

fab
Fabrication. In semiconductor manufacturing, fabrication usually refers to the front-end process of making devices and integrated circuits in semiconductor wafers, but does not include the package assembly (back-end) stages.

FAE
Field **A**pplication **E**ngineer. A term used to describe an employee specifically engaged in helping customers apply ZeroMicron products in various circuits and designs.

fault
A defect in a semiconductor that can cause a failure during operation. Usually caused by processing defects.

FPD
Focal Plane Deviation The largest of the absolute values of the deviations from a reference plane.

foundry
A wafer production and processing plant. Usually used to denote a facility that is available on a contract basis to companies that do not have wafer fab capability of their own, or that wish to supplement their own capabilities.

fringe
One of the light or dark bands produced by interference or diffraction of light.

front end
In semiconductor manufacturing, the fabrication process in which the integrated circuit is formed in and on the wafer.

FTY
Final Test Yield.

functional tests
The application of functional inputs and the corresponding responses that assure proper operation of a part, tool or system.

furnace wafer
A wafer which can be used for monitoring thermal processes or as an implant monitor and is usually only used in a cleanroom.

G

GaAs
Gallium Arsenide. A III-V compound semiconductor material used for making optoelectronic devices and high-frequency ICs. GaAs has a higher electron mobility than silicon, thus having the capability of producing higher-speed devices. Electrons in GaAs travel at twice the speed of those of silicon.

global flatness
The total indicator reading (TIR) or the maximum focal plane deviation (FPD) relative to a specified reference plane within the fixed quality area. The condition of the earth prior to Christopher Columbus.

GB3NMPR
Global, Back-surface 3-point reference plane, No (not corrected for gravitational Median-surface measurement, Partial surface scanned, Range. Definition term = "warp". SEMI defined measurement.

GM3YMCD
Global, Median-surface 3-point plane, Yes (corrected for gravitational sag), Median-surface measurement at Center point, Deviation. Definition term = "bow". SEMI defined measurement.

GMLYMER
Global, Median-surface Least-squares reference plane, Yes (corrected for gravitational sag), Median-surface measurement, Entire surface scanned, Range. Definition term = "warp". SEMI defined measurement.

GFLYFER
Global, Front-surface Least-squares reference plane, Yes (corrected for gravitational, Front-surface measurement, Entire surface scanned, Range. Definition term = "sori". SEMI defined measurement.

H

hand scribe mark
Any marking, usually on the back surface of a wafer, scratched manually into the surface, as with a diamond tipped scribe, for purposes of wafer identification.

hardware
The physical components of a circuit or system, both passive and active. Compare software.

harsh environment
Conditions such as radiation exposure, temperature extremes, vibration, and dirt. Also the typical environment between the time your company announces a down-sizing and when layoffs actually occur.

haze
A mass concentration of surface imperfections micro-roughness, often giving a hazy appearance to the wafer.

hole
A mobile electron vacancy in a semiconductor that acts like a positive electron charge ($+1.6 \times 10^{-19}$ coulomb) with a positive mass. Unoccupied spot among the electrons that are bound in their orbits. Under the application of an electric field, holes move in the opposite direction from electrons, thereby producing an electric current. Holes are induced into an integrated circuit by adding small quantities of an acceptor dopant to the host silicon crystal.

I

IC
Integrated Circuit. Plural: ICs (no apostrophe). See integrated circuit.

impurity
In semiconductor technology, a material such as boron, phosphorus or arsenic added in small quantities to a crystal to produce an excess of electrons (donor impurity) or holes (acceptor impurity). This can also refer to contaminates typically limited to less what is referred to as "9-N" or one part in one billion.

ingot
A cylindrical solid made of polycrystalline or single crystalline material, for example silicon or germanium, from which wafers are cut.

insert
Term used for the precision cut porometic material added the bottom of the pocket of a polishing template. When using the S^3 technology the part is not glued in place but rotates with the wafer.

insert compression
A condition that occurs as pressure is applied in the polishing process. Typically the compression will limit the usable life of a fixed poromeric material. The ZeroMicron templates are available with replaceable inserts as well as shims that allow the usable life of the expensive poromeric material to be extended to several multiples of its normal life expectancy.

insulator
A material that is a poor conductor of electricity or heat, and used to separate conductors from one another or to protect personnel from active electrical devices. Examples: silicon dioxide (glass), silicon nitride, rubber, ceramics, wood.

integrated circuit (IC)
An electronic circuit in which many active or passive elements are fabricated and connected together on a continuous substrate, as opposed to discrete devices, such as transistors, resistors, capacitors and diodes.

interconnection
The conductive path required to achieve connection from one circuit element to others in a circuit.

I/O
Input/Output. Generally refers to the external connections of an IC that tie it to the outside world. Supply pins and control pins are usually not considered I/O.

ion
An atom that has either gained or lost electrons, making it a charged particle (either positive or negative).

ion implantation
A means for adding dopants to semiconductor material. Charged atoms (ions) of elements such as boron, phosphorus or arsenic are accelerated by an electric field into the semiconductor material. Especially useful for very shallow (<1μm) distributions of dopants in a semiconductor. Ion implantation is usually done at room temperature, with the resulting implantation-induced lattice damage removed by annealing at temperatures of approximately 700^{o}C. More precise than diffusion doping.

IYM
Integrated **Y**ield **M**anagement. See yield.

IYV
Integrated **Y**ield **V**ehicle. See yield.

J

JIT
Just In Time. Term used in manufacturing to denote requirement for delivery of products to the customer exactly when specified – neither too soon nor too late. The objective is to reduce inventory level (work in process, as well as finished goods). Such inventory reductions, in turn, lower storage expense and reduce manufacturing cycle times. ZeroMicron uses a modified JIT system and stocks ahead some of the critical materials to guard against potential shortage interruptions to manufacturing.

junction
The interface plane within a semiconductor crystal, at which the number of P- and N-type carriers are exactly equal, with a surplus of P-type on one side of the junction and N-type on the other.

K

k, or kilo
Generally a prefix meaning a multiple of 1000 ($x10^3$). Symbol: k. In digital systems, a symbol for 2^{10} or 1024 bits.

kerf
The width of cut made by a saw or other means during the process of separating a wafer into individual integrated circuits or dice. Kerf and 'scribe line' are also used to denote the area between integrated circuits on a wafer.

kilobit
1024 bits.

kilobyte
1024 bytes (8192 bits). Symbol: KB. See byte.

L

laser light-scattering event
A signal pulse of reflected laser light that locates surface imperfections on a wafer.

LCC
Leadless Chip Carrier. A surface-mounted package having metallized contacts (terminals) at its periphery. Usually made of ceramic material.

leadframe
A stamped or etched metal frame, usually connected to the bonding pads of a die by wire bonding, that provides external electrical connections for a packaged electrical device.

LED
Light-Emitting Diode. A semiconductor P-N junction diode that emits light under forward-bias conditions. The wavelength of the emitted light is a function of the semiconductor material. The crystal structure of silicon does not provide useful levels of light emission, but the structure of GaAs does, with an infrared emission wavelength.

linear
A ratio in which a change in one of two related quantities is accompanied by a directly proportional change in the other.

lithography
The transfer of a pattern or image from one medium to another, as from a mask to a wafer. If light is used to effect the transfer, the term "photolithography" applies. "Microlithography" refers to the process as applied to images with features in the micrometer range.

lithography wafer
A wafer used specifically for testing lithography equipment wherein surface flatness is key to process monitoring. This wafer is usually only used in a cleanroom environment.

LOCOS
LOCalized Oxidation Of Silicon.

lot
Wafers manufactured in the same batch and placed together in a shipment. Can refer to any batch shipment.

LPCVD
Low Pressure Chemical Vapor Deposition.

M

mask
A transparent (glass or quartz) plate covered with an array of patterns used in making integrated circuits. Each pattern consists of opaque and transparent areas that define the size and shape of all circuit and device elements. The mask is used to expose selected areas of photoresist, which defines areas to be etched. Masks may use emulsion, chrome, iron oxide, silicon or other material to produce the opaque areas.

MCC
Microelectronics and Computer Technology Corporation. A cooperative R&D consortium whose mission is to strengthen and sustain the competitiveness of member companies who share common elements of a technical vision in information technology. MCC's membership currently includes 22 shareholders and 38 associate members. Research programs include projects in areas such as software technology, computer-aided design, advanced computing technology, displays, holographic storage, power sources, superconductivity, and distributed information systems.

mechanical wafer
A wafer suitable for equipment or process testing which is usually only used outside of a cleanroom environment.

mega or M
A prefix meaning a multiple of one million ($x10^6$). Symbol: M.

megabit
Roughly one million bits, or 1,048,576 bits.

megabyte
1024 kilobytes, or 1,048,576 bytes, or 8,388,608 bits. Symbol: MB. See byte.

megarad
A dose of radiation equal to 10^6 Rads. Sometimes stated as Megarad(Si) or Megarad(SiO2), indicating the equivalent material absorbing the radiation.

MESFET / MOSFET
MEtal-Semiconductor FET. A type of FET in which the channel is formed directly beneath a metal gate, which itself is in intimate contact with the semiconductor. Compared with MOSFET, where the gate is separated from the semiconductor by a thin insulating oxide layer. Commonly used in III-V materials, such as GaAs, where the gate oxide needed to form a MOSFET is inferior to that in silicon.

metallization
The process of depositing a thin film of conductive metal onto a substrate and patterning it to form the desired interconnection arrangement. Metal layers are typically 1-2 micron thick in ICs, but several times thicker in power devices.

MFR
Manufacturing For Reliability.

micro
A prefix meaning one-millionth ($x10^{-6}$). Symbol: µ. Also jargon for microprocessor, microcomputer, microcontroller.

micrometer
One-millionth ($x10^{-6}$) of a meter, or about 40 millionths of an inch. Synonymous with micron. Symbol: µm.

micron
Older term for micrometer. A metric unit of linear measure which equals one millionth of a meter. Symbol: µm

microroughness
Surface roughness with spacing between the contaminants or imperfections with a measurement of less than 100 µm.

mil
One-thousandth of an inch ($x10^{-3}$ inches). Equal to 25.4 microns. Also slang term for what I wish I had a few of.

milli
Prefix meaning one-thousandth ($x10^{-3}$). Symbol: m.

N

New Classic
A brand name for the ZeroMicron ruggedized version of the industry standard template. This template is designed to not delaminate in use, reduce blowouts and withstand many more hours of production use.

noise
Unwanted acoustic or electromagnetic disturbances, as opposed to desired signals.

notch
An indent on the edge of a wafer used for orientation purposes.

NPN transistor
A two-junction transistor with an N-type collector and emitter and a P-type base.

NRE
Non-Recurring Engineering. A one-time charge for development, test and prototype tooling, and associated engineering costs.

ns, nsec
Abbreviations for nanosecond ($x10^{-9}$ second). One thousandth of a microsecond. Electronic signals travel approximately one foot per nsec in room temperature copper.

N-type semiconductor
A semiconductor type in which the density of holes in the valence band is exceeded by the density of electrons in the conduction band. N-type behavior is induced by the addition of donor impurities, such as arsenic or phosphorus, to the crystal structure of silicon.

O

off-orientation
Wafers with both the misorientation angle from the growth axis and its angular tolerance specified.

on-orientation
Wafers with the angular tolerance from the plane perpendicular to the crystal growth axis specified.

optoelectronic device
A device that is responsive to or that emits or modifies light waves. Examples are LEDs, optical couplers, laser diodes, and photo detectors.

orange peel
A roughened surface that is visible to the unaided eye. Also the outer skin of the fruit typically after it has been removed from the orange.

over-voltage
A voltage in excess of the normal operating voltage of a device or circuit.

over-voltage protection
Also referred to as "transient suppression." A term used to describe the built-in capability of an electrical circuit to dissipate or shunt electrical impulse energy at a voltage low enough to ensure the survival of circuit components.

oxidation
Growth of Oxide, formed during diffusion in a furnace at > 800° C.

P

package
The protective container or housing for an electronic component or die, with external terminals to provide electrical access to the components inside. Packages provide for power and signal distribution, power dissipation, and physical and chemical protection of the circuits.

pad conditioning
A process that help to restore the original properties of a polishing pad.

pad pocket
A tool perfected and patented by ZeroMicron for use on very hard materials such as silicon carbide or sapphire. This tool uses a polishing pad that can be shape corrected, mounted in the template pocket and adjusted for proper wafer polishing exposure. The construction allows the wafer to rotate in the pocket to provide an even finish thus reducing the polish time and improving the surface flatness characteristics.

padsert
This is a variation on the pad pocket (above) and uses the shim spinning system technology (see S^3). The combination of the padsert with the shim allows the user the ability to adjust the wafer exposure while providing the endurance required for very hard materials.

particle
A small piece of material found on a wafer that is not connected with it, typically foreign particle.

particle wafer
A wafer which can be used for monitoring area or process cleanliness and is only used in a cleanroom environment.

passivation
A layer of insulating material deposited over a wafer or a region of a device to stabilize and protect the surface against moisture, contamination, and mechanical damage. Silicon dioxide or silicon nitride are often used for IC passivation.

PECVD
Plasma-Enhanced Chemical Vapor Deposition. CVD with the gases first passing through a plasma.

performance node
A performance node is a control parameter which has limited influence on reliability but which does impact the yield, productivity, or other set of economic indices associated with the product or technology.

pH

In chemistry, pH is a measure of the acidity or basicity of an aqueous solution. Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or alkaline. Pure water has a pH very close to 7. Measurement of pH for aqueous solutions can be done with a pH meter or using indicators. In technical terms, pH is the negative logarithm of the activity of the (solvated) hydronium ion, more often expressed as the measure of the hydronium ion concentration. pH is a critical measurement in polishing slurries and cleaning wafers.

photolithography
Lithographic techniques involving light as the pattern transfer medium. See lithography.

photoresist
A light-sensitive liquid that is spread as a uniform thin film on a wafer or substrate. After baking to solidify the liquid, exposure of specific patterns is performed using a photomask. Material remaining after development shields regions of the wafer from subsequent etch or implant operations.

pit
A depression, hole or chip imperfection found on the surface of a wafer.

pitch
The center-to-center spacing between pads, rows of bumps, pins, posts, leads, gears, pockets, etc.

platen
The rotating base on which the polishing pad is mounted also known as a table.

platen template
An innovative development patented by ZeroMicron that places the wafer on the platen and uses the polishing head to hold the polishing pad. Coupled with the S^3 technology, it allows wafers much larger than the polishing head to be processed. For example, a 450mm wafer can be polished on a 26 inch platen with a 12 inch polishing head.

P-N junction
The basic structure formed by the intimate contact of P-type and N-type semiconductors. The important characteristic of a P-N junction is that it will conduct electric current with one polarity of applied voltage (forward bias) but will not conduct with the opposite polarity (reverse bias).

PNP transistor
A semiconductor junction transistor with a P-type collector and emitter, and an N-type base. In such a device, the current amplification arises from the injection of holes from the emitter into the base, and their subsequent collection in the collector.

pocket
A term used to refer to the recess in a polishing template that receives the wafer or work piece to be polished or planarized.

pocket depth

The depth of the template pocket. This is a critical dimension as a shallow pocket will result in the wafer or work piece not being retained during polishing (see blow out) while a pocket that is too deep will not allow the part to be polished. The best pocket depth to extend template life and provide best results is between 20% and 25% of the work piece thickness on standard parts.

polishing head
Polishing tools typically have multiple heads that hold the wafers that are then lowered onto a polishing pad mounted on a platen. Some tools typically used in laboratories or universities or for limited production capabilities will have a single polishing head. ZeroMicron has developed a system that allows the user to mount the polishing pad on the head and large wafers or multiple wafers on the platen.

polishing pad
Any of a group of products with various hardness and cell structure that are used to polish wafers. They are mounted to the platen or polishing table. ZeroMicron has introduced a system where the pad is mounted on the polish head while the wafer is placed on the platen. This allows a smaller tool to handle large wafers (up to 450mm) or more wafers per polishing cycle.

point of use
At the point of consumption instead of at a centralized location; closest to actual application.

point defect
A crystal defect that is an impurity, such as a lattice vacancy or an interstitial atom.

poromeric
Sometimes referred to as poromerics, poromeric imitation leathers are a group of synthetic "breathable" leather substitutes made from a plastic coating (usually a polyurethane) on a fibrous base layer (typically a polyester). The term poromeric was coined by DuPont as a derivative of the terms micro-porous and polymeric. Poromeric material is used for some polishing pads and as wafer retaining insert material in templates due to its high water adhesion properties of the micro-pore structure.

printed circuit
A circuit in which the wires or components have been replaced by a conductive pattern printed upon or bonded to the surface of an insulating board.

protrusion
As applied to wafer polishing, protrusion refers to the amount of wafer exposed by the polishing template. Protrusions of 30% or more are the primary cause of blow-outs, a condition where the wafer is pushed out of the polishing template pocket with catastrophic results. ZeroMicron templates are designed for 15% to 25% wafer protrusion.

PTM time
Product-To-Market time. The time required to develop a new product, measured from the initiation of a development program to product introduction.

P-type semiconductor
A semiconductor type in which the density of electrons in the conduction band is exceeded by the density of holes in the valence band. P-type behavior is induced by the addition of acceptor impurities, such as boron, to the crystal structure of silicon.

PVD
Physical Vapor Deposition. A process for depositing a thin film on a wafer that involves aiming a stream of gas at a target. Secondary emission releases material from the target which is then deposited on the wafer. This process is also known as sputtering.

PWM
Pulse-Width Modulation. A form of analog control in which the duration of digital pulses is varied analogously with the signal of interest.

Q

QFD
Quality Function Deployment. A methodology for developing products that meet the needs of the customer.

QML
Qualified Manufacturer's List per military or client standard.

quality control
A term denoting the functions or collection of duties that must be performed in order to carry out a company's quality objective. In some companies, quality control refers to a limited function, such as analysis of quality data or inspection of products before shipment to customers and discard or rework of flawed ones. At ZeroMicron, quality control (more often called Total Quality Management, or TQM) refers to a broad set of programs and responsibilities at all levels of the organization aimed at detecting and preventing errors at every step in the manufacturing process, from order entry through fabrication, packaging, shipment and invoicing the customer.

Quality First initiative
An extensive and long-term initiative throughout ZeroMicron with three major objectives: (1) To increase customer satisfaction; (2) Grow the company by growing new products; and (3) Make continuous improvements in everything every business unit of the company does. The Quality First initiative is far more comprehensive in scope than application to products alone. Embedded in the initiative are such programs as Just In Time, Quality Involvement, Quality Audits, Employee Improvement Teams, and Total Quality Systems Reviews. The ultimate objective is a quantum and fundamental change in the way ZeroMicron does business, moving away from traditional, vertical management structures toward cross-functional teams. At the heart of the concept is customer satisfaction and the notion that end (external) customers are best satisfied as the result of a chain of satisfied internal customers.

R

R&R
Repeatability and Reproducibility. A method of testing systems or processes that repeats the test across multiple conditions, tools and operators. Also known as Rest and Relaxation, a permanent condition in Washington DC political offices that they refer to as “work”.

rad
Specifies the amount of energy transferred to a material by ionizing radiation. One rad is equal to the energy of 100 ergs per gram of material. The material must be specified, because the energy differs with each material. 1 rad-Si=100 ergs/grams of silicon.

rad-hard
RADiation HARDened. See radiation hardened circuit.

real-time operation
Data processing technique in which information is utilized as events occur and the information is generated, as opposed to batch processing at a time unrelated to the time the information was generated.

reclaimed wafer
A wafer which has been reconditioned for subsequent utilization.

removal rate
The amount of material removed in polishing or CMP process during a given amount of time.

reticle
A photomask used in a stepper.

roughness
The texture found on the surface of the wafer that is spaced very closely together.

S

S^3
Shim Spinning System. A technique perfected and patented by ZeroMicron that allow the wafer to rotate in the polishing tool. Wafers held in a fixed position have more material removed from the outer edge due to the higher velocity at the outer edge. This technique allows the wafer to rotate in the polishing pocket of the template and provides a more even removal. A more even removal results in less polishing time required which in turn means lower surface distortions like waviness, bow, warp and TTV.

SACVD
Selected Area Chemical Vapor Deposition.

SCD
Source Control Drawing. A specification for a military semiconductor device that is specific to a program, a vendor, or a customer.

scratch
A defect on a polished optical surface whose length is many times its width.

scribe and break
The procedure used to separate a processed wafer into individual ICs. Narrow channels between individual ICs are mechanically weakened by scratching with a diamond tip (scribe), sawing with a diamond blade, or burning with a laser. The wafer is mechanically stressed and broken apart along the channels (called scribe lines), thereby separating the individual ICs (dice).

sealing
Joining the package case header or substrate to its cover or lid.

selectivity
The ratio of the relative removal rates on two or more materials.

SEMATECH
SEmiconductor MAnufacturing TECHnology research consortium. A consortium of 14 American semiconductor manufacturing firms dedicated to restoring America's manufacturing leadership in semiconductors. Located in Austin, Texas, half of its annual funding is provided by its member companies and half by the federal government. Research results are transferred to member firms and to the government for both commercial and military applications.

semiconductor
A class of materials, such as silicon and germanium, whose electrical properties lie between those of conductors (such as copper and aluminum) and insulators (such as glass and rubber). A material that exhibits relatively high resistance in a pure state and much lower resistance when it contains small amounts of certain impurities. The term is also used to denote electronic devices made from semiconductor materials.

sensor
A component that provides an electrical signal in response to a specific physical or chemical stimulus such as heat, pressure, magnetic field, pH or a particular chemical vapor.

shim
A shim is a mechanical spacer used to properly space or adjust position. In the context of polishing templates it refers to the ZeroMicron pocket depth adjustment shim that insures proper wafer protrusion for polishing or to the shim used to compensate for the compression of the poromeric insert. Poromeric inserts can be very expensive compared to PET shims and this method can extend the life of the poromeric insert by up to three times the normal life.

shimsert
A variation of the ZeroMicron patented Shim Spinning System (see S^3) where the shim and poromeric insert material are joined to form a single part for simplicity in manufacturing. This one piece assembly eliminates the two piece shim and insert and removes the potential of multiple shims being used resulting in excessive wafer protrusion above the pocket.

Shim Spinning System
See S^3

silicon
A solid element that is abundantly available in the form of SiO_2 (glass). It is element 14 in the periodic table, with an atomic weight of 28.09. Silicon has a diamond crystal lattice, a density of 2.328 g/cm^3 and a melting point of 1415^{o}C. Its extreme abundance, moderate processing temperatures, and the stability of its native oxide (SiO_2) have made it the electronic semiconductor material of choice for nearly four decades.

silicon-on-insulator
See SOI.

SIMOX
Separation by IMplantation of OXygen. A process used to prepare SOI substrates. A very heavy dose of oxygen is implanted below the surface of a silicon wafer, after which the wafer is annealed at high temperature to convert the oxygen-implanted region into silicon dioxide. The growth of epitaxial silicon (on the surface, above the oxide layer) completes the SOI substrate.

SIMS
Secondary Ion Mass Spectrometry.

simulation
The process of using software to model a system. Because it is expensive and time consuming to build systems or devices, simulation is used extensively before fabrication to verify that systems or devices will work properly.

site

An area on the front surface of the wafer that has sides parallel and perpendicular to the primary orientation flat. Typically a site is the area occupied by a chip or planned chip.

Site Flatness STIR
The total indicator reading (TIR) or the maximum focal plane deviation (FPD) of the portion of the site that falls within the fixed quality area.

slice
To cut into wafers. In semiconductor technology, to cut a crystalline ingot into thin pieces (wafers or slices) upon which the device patterns are subsequently formed. Another term for wafer. Also, a type of chip architecture that permits the cascading or stacking of devices to increase word bit size.

SLM
Single-Level Metal. The use of only one level of metal to form the contact interconnections in an IC.

SMT
Surface-Mount Technology. The mounting of components on the surface of a printed circuit board, as contrasted with through-hole mounting where component leads extend through the board.

SOG
Spin On Glass, a type of dielectric used to try to planarize the die surface so that large step coverage issues are avoided.

SOI
Silicon-On-Insulator. A composite structure consisting of an active layer of silicon deposited on an insulating material. The insulator can be sapphire (as in SOS), silicon dioxide, silicon nitride, or even an insulating form of silicon itself. The ICs subsequently deposited in the active silicon layer can have advantages of radiation hardness, speed, and high-temperature operation.

solderability
The ability of a conductor to be wetted by hot solder and to form a strong low-resistance bond with the solder.

solid state
Refers to the electronic properties of crystalline materials, generally semiconductor--as opposed to vacuum and gas-filled tubes that function by flow of electrons through space, or by flow through ionized gases. Solid state devices involve the interaction of light, heat, magnetic field, and electric currents in crystalline materials. Compared to earlier vacuum-tube devices, solid-state components are smaller, less expensive, more reliable, use less power, and generate less heat. The integration and miniaturization of solid-state devices has led the high-technology electronic evolution throughout the past 30 years.

sori

The “sori” of a semiconductor wafer is defined as the difference between the maximum and minimum distances to the front surface of a free, unclamped wafer from the least squares reference plane of the front surface. The sori measurement of a large diameter silicon wafer, for example 300mm wafer, at nanometer order is required in order to achieve the maximum yield of semiconductor device processing.

SOS
Silicon-**O**n-**S**apphire. A CMOS technology in which a layer of silicon is epitaxially grown on a sapphire wafer, with specific regions subsequently etched away between individual transistors. Each device is thus totally isolated from other devices. Since sapphire is an insulator, SOS is a subset of SOI (silicon-on-insulator) technology. Both SOI and SOS technologies provide for high levels of radiation hardness.

spacer shim
See shim

SPC
Statistical Process Control. A technique to ensure that a manufacturing process is controlled to the limits of its capability. With SPC, each time a process is monitored its behavior is compared against limits that have been established by statistical data on the same process.

specific gravity
The ratio of the density of a material to the density of water.

Sputtered
A method of depositing a metal film.

Sputtering
See PVD.

SRC
Semiconductor Research Corporation. The SRC is a consortium of more than 60 member companies and government agencies planning and executing programs of applied research at leading U.S. universities to strengthen the competitive ability of the U.S. semiconductor industry. Formed by the Semiconductor Industry Association in 1982, the SRC today is the largest industry-driven research program in the nation.

static
A state in which a quantity exhibits no appreciable change over time. Not to be confused with the electrical charge, electrostatic or the verbal term for what is typically dispensed by upper management especially when discussing your next raise.

statistical modeling
A modeling technique in which the parameters that define the model are not fixed numbers but are correlated to a fundamental set of independent variables. This allows Monte-Carlo type analysis controlled by random numbers to cause the same distributions of performance in the

simulator that occur in manufacturing. Statistical analysis routines can then be applied to the statistical simulation database to predict yields, performance to spec, and high-level performance distributions.

stepper
Photo equipment used to transfer a reticle pattern onto a wafer. Because of its limited field of view, low throughput, and high cost, such equipment is usually used only for feature size smaller than 1.5 microns, where resolution and line-width control are critical.

striation
Defects or contaminations found in the shape of a helix.

substrate
The underlying material on which a microelectronic device is built. Such material may be electrically active, such as silicon, or passive, such as alumina ceramic.

superconductivity
The flow of electric current with negligible resistance in certain metals and alloys and over certain temperature ranges. In recent years, superconductivity has been achieved at temperatures as "high" as -140^{o}C.

surface flatness
The surface flatness as in as measured by an optical flat, given in terms of waves – wave length = 633nm or 25 millionth of an inch.

surface roughness
The arithmetic average of the absolute values or the average length between the peaks and valleys.

sworf
Material or debris generated during the polishing process that is a combination of the removed material, pad and slurry.

system
An integrated whole that is comprised of diverse interacting, specialized structures and sub-functions. A collection of people, machines (hardware) and software organized to accomplish a set of specific functions.

system-level integration
The progressive linking and testing of system components into a complete system.

T

TAB
Tape Automated Bonding. A process utilizing metal conductors on beam tape that are mass bonded to the integrated circuit in a single operation. TAB offers the advantage of allowing a circuit to be tested at high frequencies and proving it in good condition without the expensive alternative of mounting it in a module for testing, thus avoiding the need to rework modules.

TAM
Total Available Market. Used to show actual dollars spent in a market. Also used by venture capitalists to fleece investors.

TEOS
TetraEthylOrthoSilicate, a liquid source oxide deposition with excellent uniformity, step coverage and film properties. Disadvantage is high temperature and liquid source requirements.

test vehicle
A fully functional product or an array of test devices and structures used to develop process integration and control. Commonly used by the DOT (Department of Transportation) as a term for vehicles that they smash into cement walls. Used on a much smaller scale in the semiconductor industry and usually less destructive.

test wafer
A wafer suitable for process monitoring in semiconductor manufacturing. Also called monitor wafer.

tinning
To coat metallic surfaces with a thin layer of solder.

TIR
Total Indicator Reading. The span of readings, from maximum to minimum, for any dimension measured.

TLM
Triple-Level Metal. An IC metal interconnect process that employs three vertical levels of metal, separated by insulating layers. Such a dense configuration requires that each metal interconnect layer be made planar before the subsequent layer is deposited.

total dose
Term used to describe the total exposure of an IC to ionizing radiation, typically gamma rays, energetic electrons, or X-rays. Most commercial ICs are very sensitive to ionizing radiation and degrade in their performance upon exposure.

TQM
Total Quality Management. See Quality First initiative.

transfer molding
The process of forming articles, in a closed mold, from a thermo-setting material that is conveyed under pressure, in a hot, plastic state.

transient over-voltage
A condition in electrical circuits resulting from a sudden release of energy. Often this condition is precipitated by a static discharge, lightning, or switching of an inductive load. May occur in repeated fashion or randomly. See over-voltage.

transient radiation
A pulse of ionizing radiation. Transient radiation can cause data upset, device latchup, and destruction of unprotected ICs.

transistor
A three-terminal active semiconductor device that provides current amplification. A bipolar transistor is comprised of base, emitter and collector and is a current-controlled device with a low input impedance. A field-effect transistor has gate, source, and drain electrodes and is a high-impedance, voltage controlled device. The first transistor was invented at Bell Laboratories in 1947 by Nobel-Prize physicists John Bardeen, William Shockley and Walter Bratain.

TTV
Total Thickness Variation. The difference between the maximum and minimum values of thickness encountered during a scan pattern or series of point measurements.

U

UHF
Ultra High Frequency. The portion of the radio spectrum between 300 and 3000 megahertz (MHz). This includes television channels 14 through 83, as well as most radar use.

V

VHF
Very High Frequency. The portion of the radio spectrum between 30 and 300 megahertz (MHz). This includes television channels 2 through 13, the FM band, and other commercial communication bands.

virtual integration
An industrial relationship between otherwise independent companies that allows them to emulate the business activities of vertically integrated firms and compete more effectively.

voltage
Electromotive force (EMF). One volt is equal to the EMF required to force one ampere of current through one ohm of resistance. Symbol: V.

W

wafer
A thin slice, typically 10-30 mils thick, sawed from a cylindrical ingot (boule) of bulk semiconductor material (usually silicon), four to eight inches in diameter. Arrays of ICs or discrete devices are fabricated in the wafers during the manufacturing process. See Czochralski, IC, mil, silicon.

wafer protrusion
The amount that a wafer protrudes above the polishing template. Low quality templates are typically designed to allow 30% to 35% protrusion. ZeroMicron templates use pocket depth adjustment shims to control the depth to approximately 20% to reduce blow outs.

warp
Generally the most often specified shape parameter. The differences between the maximum and minimum distances of the median surface of a free, un-clamped wafer from a reference place. Note that there are two forms of warp, one corrected for gravitational sag and the other not so corrected.

WAT
Wafer Acceptance Test. See wafer.

water adhesion
Adhesion in water are made possible by positively charged hydrogen molecules bonding to negatively charged molecules. Hydrogen bonds are special in that they can break and reform with great frequency. This constant rearranging of hydrogen bonds allows a substantial percentage of all the molecules in a given sample to bond to each other (cohesion) or to another substance (adhesion), or both. This collection of hydrogen bonds allows for the tight binding of the substances and makes the molecules cling together.

waviness
Widely-spaced surface height imperfections on the surface of a wafer.

waxless mount
A method of mounting wafers in a wafer holder (polishing template) without using wax to mount the wafer. The wafer is set on a poromeric material that has high water adhesion properties. The poromeric material is inserted into the wet pocket and holds the wafer in place. The process is related to a condition called “jo-blocking” named for the state where two highly polished surfaces (jo blocks or gauge blocks) are joined with a liquid film, oil, water or even high humidity, and can only be separated with a high lateral force.

wire bonding
The most common method of making the electrical inter- connection from the chip to the leads on a package There are three basic methods: thermal compression, ultrasonic, and pulse. The wires are typically made of either aluminum or gold and are usually 1.25 to 1.50 mils in diameter for ICs but can be as large as 15 mils in diameter for power devices. See mil.

WLR
Wafer Level Reliability. See wafer.

X

X-ray lithography
The lithographic process for transferring patterns to a silicon wafer in which the electromagnetic radiation used is X-ray, rather than visible radiation. The shorter wavelength for X-rays (10-50 angstroms, versus 2000-3000 angstroms for ultra-violet radiation) minimizes diffraction, and extends the useful range of lithography towards 0.1μm. Optical lithography is currently thought to be limited to feature sizes above 0.25-0.3μm. See lithography and angstrom.

Y

YEA
Yield Enhancement Analysis.

yield
The percent of wafers, dice, or packaged units conforming to specifications. The most common yields in the manufacturing process are: wafer fab yield (percentage of the wafers that complete wafer processing); wafer probe yield (the fraction of dice on a wafer that meet device specifications); assembly yield (percent of units that are assembled correctly); and final test yield (percent of packaged units that pass all device specifications).

Z

ZeroMicron
The producer of the worlds most accurate and rugged waxless mount polishing templates, pad dressers, geared templates, quick change pads, quick change templates and custom wafer polishing holders. ZeroMicron provides consulting services to its clients to insure that they receive the maximum benefit from the ZeroMicron products.

ZeroMicron personnel
The most knowledgeable, helpful, intelligent and friendly people in the semiconductor industry.

Common Units of Measure
Conversion Tables

The following tables offer some common conversions for:

- Distance and length
- Measurements of area
- Measurements of volume
- Weight
- Pressure
- Temperature

The tables are provided as a courtesy and are not intended to be complete or comprehensive.

The best web site that we have found for easy conversion of units is:

www.convert-me.com

and we highly recommend this site for comprehensive conversions of measurements.

Distance and Length Conversions

Unit	Symbol	System	Equivalent	Units	Symbol	System
kilometer	km	metric	1000	meters	m	metric
kilometer	km	metric	0.62	miles	mi	US
kilometer	km	metric	1093.61	yards	yd	US
meter	m	metric	100	centimeters	cm	metric
meter	m	metric	1.09	yards	yd	US
meter	m	metric	3.28	feet	ft	US
centimeter	cm	metric	10	millimeters	mm	metric
centimeter	cm	metric	0.394	inches	in	US
millimeter	mm	metric	1000	microns	µm	metric
millimeter	mm	metric	0.0394	inches	in	US
millimeter	mm	metric	39.370	mils	mil	US
micrometer (micron)	µm	metric	1000	nanometers	nm	metric
micrometer (micron)	µm	metric	0.03937	mils	mil	US
nanometer	nm	metric	1000	picometers	pm	metric
Ångstrom	Å	metric	0.10	nanometers	nm	metric
Ångstrom	Å	metric	100	picometers	pm	metric
mile	mi	US	1.61	kilometers	km	metric
mile	mi	US	1610	meters	m	US
mile	mi	US	1760	yards	yd	US
mile	mi	US	5280	feet	ft	US
yard	yd	US	0.91	meters	m	metric
yard	yd	US	3	feet	ft	US
yard	yd	US	36	inches	in	US
foot	ft	US	0.30	meters	m	metric
foot	ft	US	30.48	centimeters	cm	metric
foot	ft	US	12	inches	in	US
inch	in	US	1000	mils	mil	US
mil	mil	US	25.4	microns	µm	metric
light year	ly	metric	9.461T	kilometers	km	metric
light year	ly	US	5.879T	miles	mi	US

Measurements of Area

Unit	Symbol	System	Equivalent	Units	Symbol	System
hectare	ha	metric	10,000	square meters	m^2	metric
hectare	ha	metric	2.47	Acres	ac	US
hectare	ha	metric	107,639	square feet	ft^2	US
square mile	mi^2	US	2.59	square kilometers	km^2	metric
square mile	mi^2	US	259	hectares	ha	metric
square mile	mi^2	US	640	Acres	ac	US
square km	km^2	metric	100	hectares	ha	metric
square km	km^2	metric	0.386	square miles	mi^2	US
acre	ac	US	0.405	hectares	ha	metric
acre	ac	US	4047	square meters	m^2	metric
square meter	m^2	metric	1.196	square yards	yd^2	US
square meter	m^2	metric	10.764	square feet	ft^2	US
square meter	m^2	metric	10,000	square centimeters	cm^2	metric
square yard	yd^2	US	0.836	square meters	m^2	metric
square yard	yd^2	US	9	square feet	ft^2	US
square foot	ft^2	US	144	square inchs	in^2	US
square centimeter	cm^2	metric	0.155	square inchs	in^2	US
square centimeter	cm^2	metric	100	square millimeters	mm^2	metric
square millimeter	mm^2	metric	0.00155	square inchs	in^2	US
square millimeter	mm^2	metric	1550	square mils	mil^2	US
square mil	mil^2	US	645.16	square microns	μm^2	metric

Measurements of Volume

Unit	Symbol	System	Equivalent	Units	Symbol	System
cubic centimeter	cc	metric	1	milliliter	ml	metric
centiliter	cl	metric	10	milliliter	ml	metric
cubic centimeter	cc	metric	1000	cubic millimeter	mm^3	metric
cubic centimeter	cc	metric	1000	microliter	µl	metric
liter	l	metric	1000	milliliter	ml	metric
liter	l	metric	1	cubic decimeter	dm^3	metric
cubic meter	m^3	metric	1000	liter	l	metric
centiliter	cl	metric	0.6102	cubic inch	in^3	US
cubic meter	m^3	metric	35.315	cubic foot	ft^3	US
cubic meter	m^3	metric	1.308	cubic yard	yd^3	US
liter	l	metric	1.057	quart (US)	qt	US
liter	l	metric	0.8799	quart (UK)	qt	UK
cubic foot	ft^3	US	28.317	liter	l	metric
cubic foot	ft^3	US	1728	cubic inch	in^3	US
cubic foot	ft^3	US	119.69	cup	cup	US
cubic foot	ft^3	US	7.481	gallon (US)	gal	US
cubic foot	ft^3	US	6.229	gallon (UK)	gal	UK
gallon (US)	gal	US	3.785	liter	l	metric
gallon (UK)	gal	UK	4.546	liter	l	metric
gallon	gal	US/UK	4	quart	qt	US/UK
quart (US)	qt	US	0.9464	liter	l	metric
quart (UK)	qt	UK	1.137	liter	l	metric

Weight

Unit	Symbol	System	Equivalent	Units	Symbol	System
kilogram	kg	metric	0.001	tonnes	tonne	metric
kilogram	kg	metric	1000	grams	g	metric
kilogram	kg	metric	2.205	pounds	lb	US
kilogram	kg	metric	0.1575	stone	stone	UK
kilogram	kg	metric	35.27	ounces	oz	US
gram	g	metric	100	centigrams	centigrams	metric
gram	g	metric	1000	milligrams	mg	Metric
gram	g	metric	0.0353	ounces	oz	US
gram	g	metric	0.5644	drams	dr	US
gram	g	metric	15.43	grains	gr	US
milligram	mg	metric	0.0154	grains	gr	US
ton (US)	ton	US	2000	pounds	lb	US
ton (US)	ton	US	0.8929	tons (UK)	ton	UK
pound	lb	US	16	ounces	oz	US
pound	lb	US	256	drams	dr	US
pound	lb	US	7000	grains	gr	US
pound	lb	US	0.4536	kilograms	kg	metric
pound	lb	US	453.6	grams	g	metric
ounce	oz	US	16	drams	dr	US
ounce	oz	US	28.35	grams	g	metric
grain	gr	US	64.8	milligrams	mg	metric

Pressure

Pressure (symbol: *P* or *p*) is the ratio of force to the area over which that force is distributed.

Pressure is force per unit area applied in a direction perpendicular to the surface of an object. Gauge pressure is the pressure relative to the local atmospheric or ambient pressure. Pressure is measured in any unit of force divided by any unit of area. The SI unit of pressure is the newton per square meter, which is called the pascal (Pa). A pressure of 1 Pa is small so everyday pressures are often stated in kilopascals (1 kPa = 1000 Pa).

Mathematically: $\boldsymbol{p = F/A}$ where $\boldsymbol{p}$ is pressure, $\boldsymbol{F}$ is the normal force and $\boldsymbol{A}$ is the area.

Non-SI measures such as pounds per square inch are used primarily in the U.S. The cgs (centimeter-gram-second) unit of pressure is the barye (ba), equal to 0.1 Pa. Pressure is sometimes expressed in grams-force/cm^2, or as kg/cm^2 and the like without properly identifying the force units.

Gauge pressure is often given in units with 'g' appended, e.g. 'kPag' or 'psig'.

Pressure Conversion Table					
	Pascal	Bar	Standard atmosphere	Torr	Pounds per square inch
	(Pa)	(bar)	(atm)	(Torr)	(psi)
1 Pa	$\equiv 1\ N/m^2$	10^{-5}	9.8692×10^{-6}	7.5006×10^{-3}	1.45038×10^{-4}
1 bar	10^5	$\equiv 10^6\ dyn/cm^2$	0.98692	750.06	14.50377
1 at	0.98067×10^5	0.980665	0.9678411	735.5592	14.22334
1 atm	1.01325×10^5	1.01325	$\equiv p_0$	$\equiv 760$	14.69595
1 Torr	133.3224	1.33322×10^{-3}	1.31579×10^{-3}	$\approx 1\ mm_{Hg}$	1.93368×10^{-2}
1 psi	6.8948×10^3	6.8948×10^{-2}	6.8046×10^{-2}	51.71493	$\equiv 1\ lb_F/in^2$

Temperature

There are three temperature scales that are commonly used, two of which are primarily used in normal measurements, Celsius and Fahrenheit and the scientific scale Kelvin.

Conversion formula:

Fahrenheit to Celsius
$[°C] = ([°F] - 32) \times {}^{5}\!/_{9}$

Celsius to Fahrenheit
$[°F] = [°C] \times {}^{9}\!/_{5} + 32$

Fahrenheit to Kelvin
$[K] = ([°F] + 459.67) \times {}^{5}\!/_{9}$

Celsius to Kevin
$[K] = [°C] + 273.15$

Kelvin to Fahrenheit
$[°F] = [K] \times {}^{9}\!/_{5} - 459.67$

Kelvin to Celsius
$[°C] = [K] - 273.15$

Comparison of temperature scales			
Comment	Kelvin	Celsius	Fahrenheit
Absolute zero	0.00	−273.15	−459.67
Lowest recorded surface temperature on Earth	184	−89.2	−128.6
Fahrenheit's ice/salt mixture	255.37	−17.78	0.00
Ice melts (at standard pressure)	273.15	0.00	32.00
Triple point of water	273.16	0.01	32.018
Average surface temperature on Earth	288	15	59
Average human body temperature	310	37	98
Highest recorded surface temperature on Earth	331	58	136.4
Water boils (at standard pressure)	373.1339	99.9839	211.97102
Titanium melts	1941	1668	3034
The surface of the Sun	5800	5500	9900

Temperature Comparison Table

Celsius	Fahrenheit	Kelvin
300.00	572.00	573.15
290.00	554.00	563.15
280.00	536.00	553.15
270.00	518.00	543.15
260.00	500.00	533.15
250.00	482.00	523.15
240.00	464.00	513.15
230.00	446.00	503.15
220.00	428.00	493.15
210.00	410.00	483.15
200.00	392.00	473.15
190.00	374.00	463.15
180.00	356.00	453.15
170.00	338.00	443.15
160.00	320.00	433.15
150.00	302.00	423.15
140.00	284.00	413.15
130.00	266.00	403.15
120.00	248.00	393.15
110.00	230.00	383.15
100.00	212.00	373.15
90.00	194.00	363.15
80.00	176.00	353.15
70.00	158.00	343.15
60.00	140.00	333.15
50.00	122.00	323.15
40.00	104.00	313.15
30.00	86.00	303.15
20.00	68.00	293.15

Celsius	Fahrenheit	Kelvin
10.00	50.00	283.15
0.00	32.00	273.15
−10.00	14.00	263.15
−20.00	−4.00	253.15
−30.00	−22.00	243.15
−40.00	−40.00	233.15
−50.00	−58.00	223.15
−60.00	−76.00	213.15
−70.00	−94.00	203.15
−80.00	−112.00	193.15
−90.00	−130.00	183.15
−100.00	−148.00	173.15
−110.00	−166.00	163.15
−120.00	−184.00	153.15
−130.00	−202.00	143.15
−140.00	−220.00	133.15
−150.00	−238.00	123.15
−160.00	−256.00	113.15
−170.00	−274.00	103.15
−180.00	−292.00	93.15
−190.00	−310.00	83.15
−200.00	−328.00	73.15
−210.00	−346.00	63.15
−220.00	−364.00	53.15
−230.00	−382.00	43.15
−240.00	−400.00	33.15
−250.00	−418.00	23.15
−260.00	−436.00	13.15
−273.15	−459.67	0.00

Application Notes

Following is a collection of Application Notes that have been generated to address specific issues. We hope that you find these helpful and interesting.

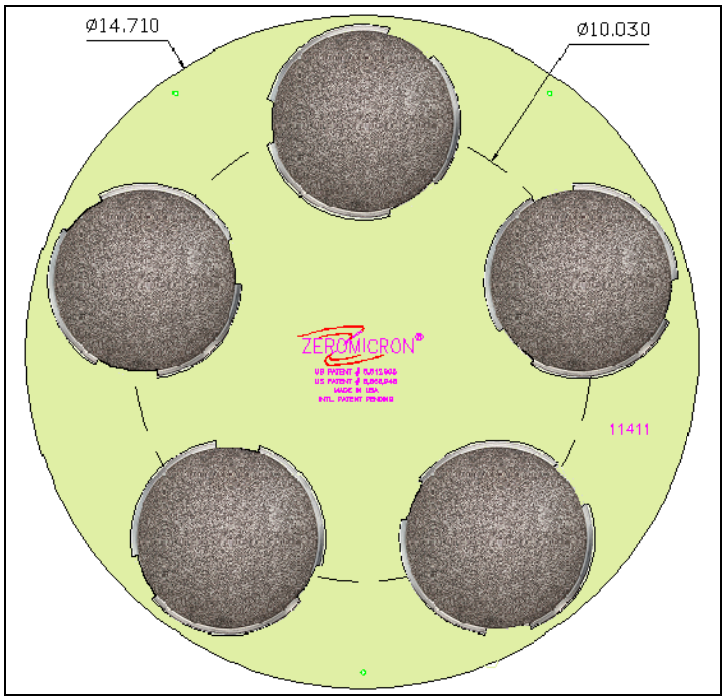
If you have an issue that you would like to see addressed, please contact us and discuss the problem or area of interest and, if practical, we will generate an application note to address that issue.

APPLICATION NOTE
13081301
Revision B

Rough Polish – Pad Dresser Application

This application note applies to the first stage or rough polish process. Typically these are polishing pads with a larger, more rigid cell structure that are used for rapid material removal.

A five "puck", 14.710 inch diameter pad dresser is pictured at the right.



These templates use a 4.25 inch "puck" manufactured by 3M Corporation that has diamonds bonded to the surface.

The "puck" is mounted in a G-10 holder that allows it to rotate freely.

The "pucks" are modified by ZeroMicron for this application.

Instructions for the application of the diamond disk pad dresser (for rough polishing pad):

1. Remove wax paper to expose the adhesive and mount the diamond disk pad dresser to the carrier.

2. Install the carrier and set up the tool for normal operating conditions for platen and carrier rotation.

3. Start the tool and apply 1 to 2 psi pressure on the carrier when conditioning.

4. Condition for 3 minutes with DI water at a flow rate of 300 to 500 mL per minute.

   Note: For a process that polishes hard substrates like sapphire or silicon carbide, some of our customers condition the pad after every run. Softer materials may require less frequent conditioning. Frequency of conditioning is dependent on the polishing pad performance as measured by the removal rate.

5. After conditioning, spray DI water onto the polishing pad to flush all residue off.

6. After use, spray and rinse the diamond disk pad dresser thoroughly and store the diamond disk pad dresser with the diamond pucks face down to allow the water to drain off.

For additional information or assistance, please contact ZeroMicron Inc. directly.

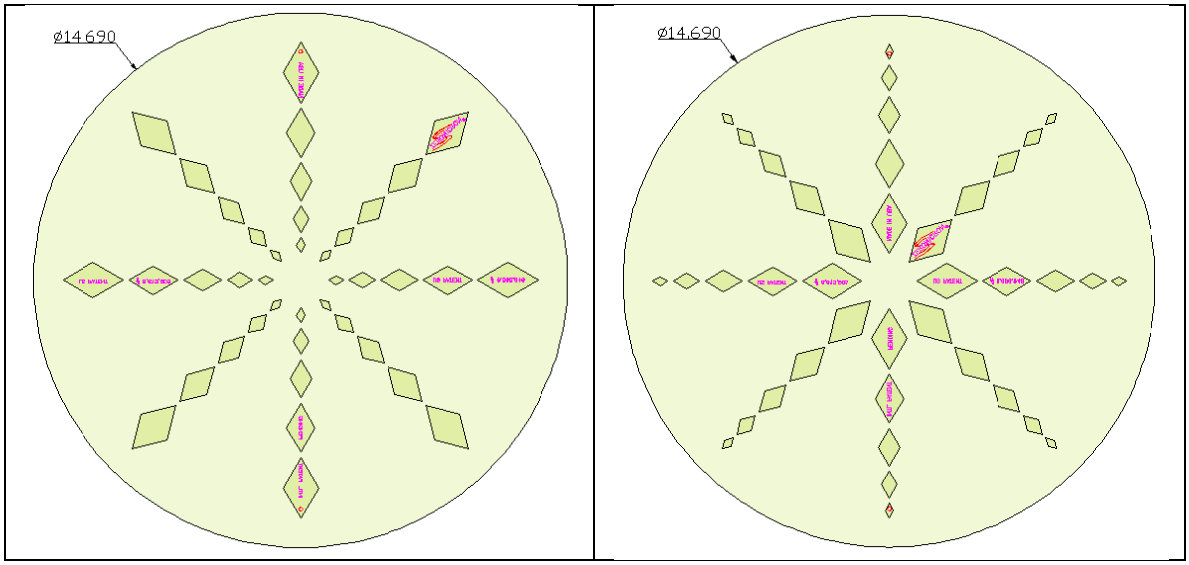
ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112
Tel: (408) 441-4600
Fax: (408) 441-9404
info@ZeroMicron.com
www.ZeroMicron.com

APPLICATION NOTE
13081301
Revision B

Final Polish – Pad Dresser Application

This application note applies to the final stage or finish polish process. Typically these are polishing pads with a smaller cell structure that are used to provide a very fine finish to the product.

The pad dressers are constructed of uniform sheet G-10 (standard) or G-11 (custom order hard material. There are several formats available including a pair of dressers as shown below in a 14.690 inch diameter. All common polish head sizes are available. The diamond pattern is raised approximately 60 mils above the surface.



Pad manufacturers recommend breaking in the pad with wafers until the pad surface becomes uniform in appearance. Our pad dressers can be used to accomplish the same function in a much shorter time and with better results. ZeroMicron pad conditioners open the pores in the pad material and planarize the surface for optimum performance. And, with pad conditioning the life of the pad can be extended.

Our tests have shown, and we have confirmed with clients, that this process is quicker than the standard break-in for a new pad, it does not require the expenditure of product, reduces haze due to a more even surface, provides a more consistent reduced particle count on production parts and increases pad life when followed up with in production pad dressing.

Instructions for the application of the diamond pattern pad dresser on a production pad:

1. Remove wax paper to expose the adhesive and mount the diamond pattern pad dresser to the carrier. This should be done with the same attention and care as when mounting a template.

2. These diamond pattern pad dressers come as a set and may be applied alternately on a single headed tool, as a pair on a tool with two heads or a tool capable of being operated with just two heads or as two pairs on a four headed tool on which all four heads operate in unison.

3. If two diamond pattern pad dressers are being used on a tool with four polishing heads, the dressers should be mounted opposite each other, 180 degrees apart.

4. Install the carrier and set up the tool for normal operating speeds for platen and carrier rotation.

5. Start the tool and apply 1 to 2 psi pressure to the carrier when conditioning.

6. Condition the pad for 2 minutes with DI water at a flow rate of 300 to 500 mL per minute. On a new pad, run time should be increased to 12 minutes.

7. For a process that polishes hard substrates like sapphire or silicon carbide, some users condition the pad after every other run. Softer materials may require less frequent conditioning depending on the polishing pad performance as measured by the removal rate. The frequency of reconditioning is very process dependent.

8. Under normal operating conditions you may observe a pattern of small bubbles forming on the polishing pad immediately behind the dresser. When this pattern is consistent it is an indication that the pad surface is being dressed evenly.

9. After conditioning, spray DI water onto the polishing pad to flush all residue off.

10. After use, spray and rinse the diamond pattern pad dressers thoroughly and store them vertically to allow the water to drain off.

11. While these dressers are designed for a long service life, the user should inspect the diamond pattern pad dresser to insure that the leading edge of the diamonds remains sharp. Dressers with worn edges should be replaced.

In a production environment we recommend that the diamond pattern pad dressers be replaced when the edges of the diamond patterns show wear. The timing will be dependent on how frequently the polishing pad is dressed. The frequency of the polishing pad dressing will, in turn, be dependent on how quickly the polishing pad performance decreases based on the material and process conditions.

Under the conditions listed above, typical pad dresser life is approximately 15 hours. This equates to the break-in of 75 new polishing pads or the reconditioning of 450 polishing pads.

Basically, when you see changes in the condition of the pad dresser, it is time to replace it. The numbers above are only suggested guidelines and will vary on depending on the user application.

The time to change the pad dresser is similar to that of changing a polishing template. The old dresser needs to be removed and the carrier cleaned to remove any glue residue. The new pad dresser can then be mounted on the carrier .

For additional information or assistance, please contact ZeroMicron Inc. directly.

ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112
Tel: (408) 441-4600
Fax: (408) 441-9404
info@ZeroMicron.com
www.ZeroMicron.com

APPLICATION NOTE
13082401
Revision A

Proper Use of Shims and Inserts - Application Note

Purpose:

The purpose of this application note is to explain the proper usage of the shims and poromeric inserts. Shims allow the user to have control and consistency of the wafer protrusion. Applying pressure on poromeric material over a period of time will result in compressing and reducing its overall thickness and wafer protrusion. Thus, using the shims will allow the user to adjust the wafer back to its ideal protrusion level.

ZeroMicron templates are designed to allow user to replace the shims or poromeric inserts after they are worn from usage. The competitors' templates have their poromeric material bonded to the frame. Since the poromeric material has a much lower life span than the frame, the frame ends up being toss away as well when the poromeric material has reached its end of life. With ZeroMicron templates, just replace the worn out shims or poromeric inserts and it can continue to be used again saving template replacements.

Below is a series of diagrams that graphically display the compression and protrusion issues.

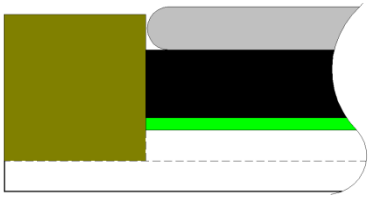
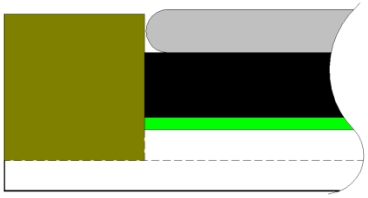
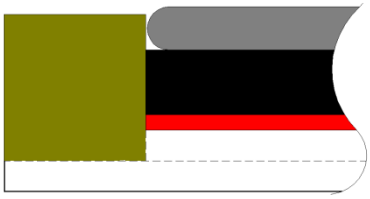
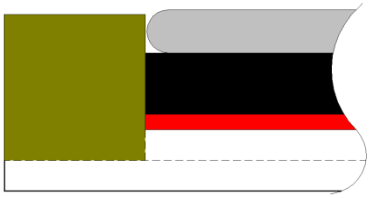
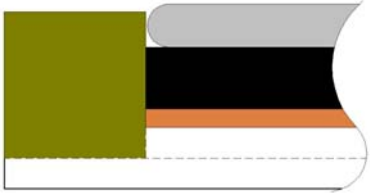
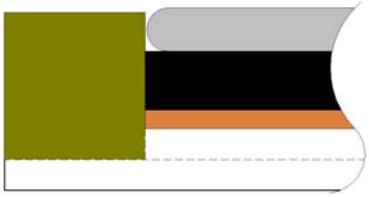
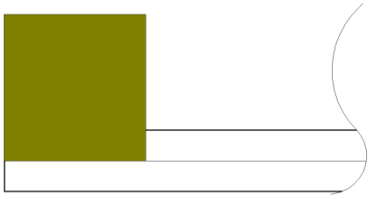
Advantages:

There are four failure modes; (1) blowout, (2) template separation, (3) backside staining and (4) worn out pockets. From client reports, we can state that ZeroMicron templates report a 75 to 80% reduction in blowouts. With other templates, a blowout requires replacement of the template. As for the ZeroMicron template, normally only requires replacement of the poromeric insert resulting in a large time and expense savings.

Other manufactures' templates bond the poromeric material, a porous structure, to the FR-4 frame creating a weak bond between the two. Further, the FR-4 material is rather thin and flexible. If the wafer starts to wear at the glue layer, the template will delaminate. The ZeroMicron template, by comparison uses a very thick and rigid frame of G-10 or on special request, G-11 material. And, the ZeroMicron template construction keeps the wafer away from the glue layers.

Backside staining occurs when the poromeric material becomes contaminated with a buildup of slurry. This is normally addressed by scrubbing the material and rinsing. With other templates, vigorous scrubbing can lead to early delamination and it is difficult to get into the edges of the pocket. With the ZeroMicron design, the poromeric inserts can be removed and scrubbed or replaced, further extending the life of the template.

Template / Shim / Poromeric Insert Replacement Chart

ZeroMicron (ZM)	Protrusion / Compression	"Competition"
	New templates ◀ 20% protrusion 30% protrusion ▶	
	20% ZM recommended compression ◀ 10% protrusion 20% protrusion ▶	
	40% ZM recommended compression ◀ install new shim ◀ 20% protrusion 10% protrusion ▶	
	60% ZM recommended compression ◀ 10% protrusion 0% protrusion ▶ Need new template ▶	
	80% ZM recommended compression ◀ install new shim ◀ 20% protrusion	
	100% ZM recommended compression ◀ 10% protrusion	
	Replace poromeric insert and original shim, ◀ NOT the template.	OOPS, Need ***yet*** another new template here.

Wafer | Poromeric Insert | FR-4/G-10 | 4 mil Shim | 5 mil Shim | 6 mil Shim | Clear PET

The last failure mode is when the wafer pocket wears out. Over many runs, the edge of the pocket will start to wear. As this wear continues, it will round the edge of the pocket off and the wafer will slip out of the pocket. Other manufacturers try to run their wafers at a 30% protrusion. This puts the apex of the wafer edge very close to the upper edge of the FR-4 material. This is done to obtain the maximum life from the template as the poromeric material is compressed. With the ZeroMicron template, this is not a concern as the depth can be adjusted for the poromeric compression. We strongly recommend a 20% protrusion. This means that the wafer edge apex is located deeper in the pocket and takes substantially longer to wear sufficiently to require replacement.

Instructions for shims and inserts

1. Three different thicknesses of shims are used. The thicknesses are in consecutive order, e.g., 3 mil, 4mil, and 5 mil, or 4 mil, 5 mil, and 6 mil, etc.

2. Use the thinnest shim of the three with a new or uncompressed poromeric insert. Be very careful to only use one shim. They tend to stick together, especially when wet so care must be taken to insure that only one shim is used.

3. When the poromeric insert is compressed by 25 microns and the wafer protrusion is reduced, change the shims to the next thicker size. This will be dependent on your material, pressure and process time.

4. When the poromeric insert is compressed by another 25 microns and the wafer protrusion is reduced again, change the shims to the next thicker size.

5. When the poromeric insert is compressed again by yet another 25 microns, replace the poromeric inserts and go back to using the thinnest shim of the three.

NOTE: Do not use the shim if it becomes opaque as this is a sign that it is at the end of its service life. If deep scratches occur, the shim should be replaced. Deep scratches are typically a sign of contamination in the template pocket.

For additional information or assistance, please contact ZeroMicron Inc. directly.

ZeroMicron Inc.
2330 South Tenth Street
San Jose, CA 95112
Tel: (408) 441-4600
Fax: (408) 441-9404
info@ZeroMicron.com
www.ZeroMicron.com