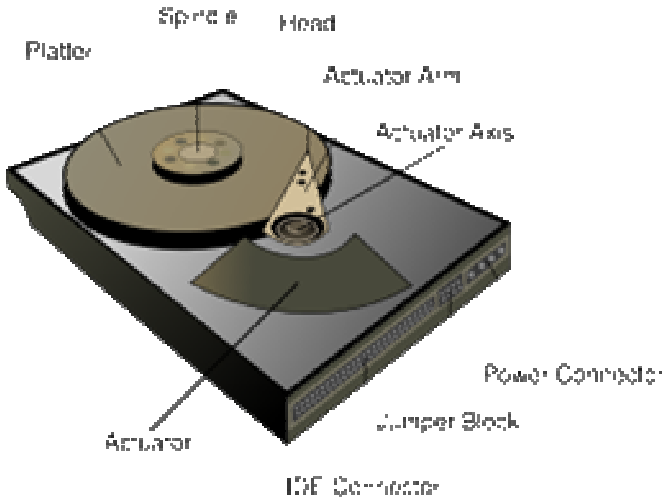
Magnetic Head Dicing Process



ADT = Dicing
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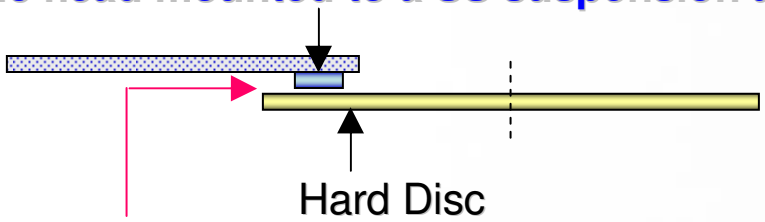
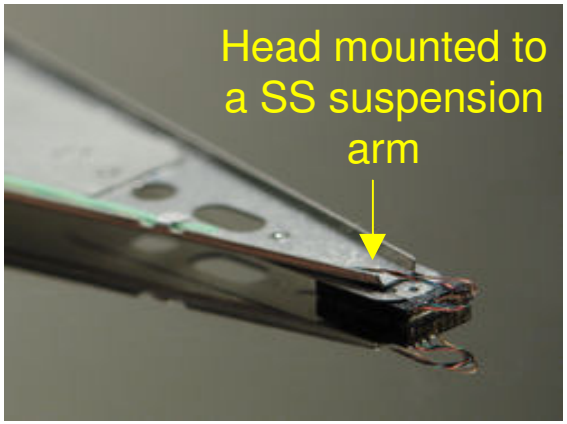
Magnetic Head Slider

Basic function of head = reading information on the hard disc

Magnetic head mounted to a SS suspension arm



Air gap (0.001- 0.002 mm)



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Physical Properties of Al203-TiC :

Color	Density (g/Cm3)	Hardness (HV)
Black	4.2	2100

Base material - Alumina + Titanium Carbide

Material to dice:

AL Titanium Carbide [ALTEC]

Sliders are composed of Al2O3 - TiC composite with a thin 10 - 20nm diamond like carbon protective overcoat

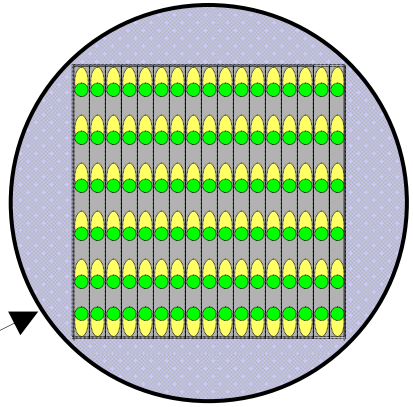
General Manufacturing process flow:

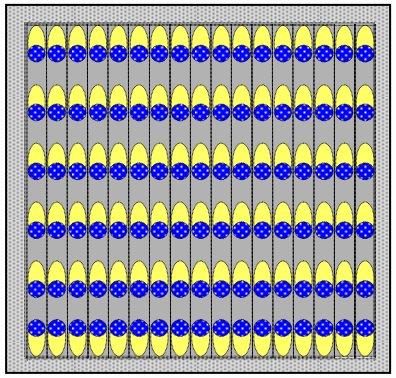
- Wafer Fabrication
- Wafer Mounting
- ➢ External shaping / dicing for reference
- Second wafer mounting [On some applications]
- ➢ Row Slicing
- Lapping the rows in reference to the coil
- Aligning and stack mounting of rows
- ➢ Head Parting

➢ - Related to the dicing process

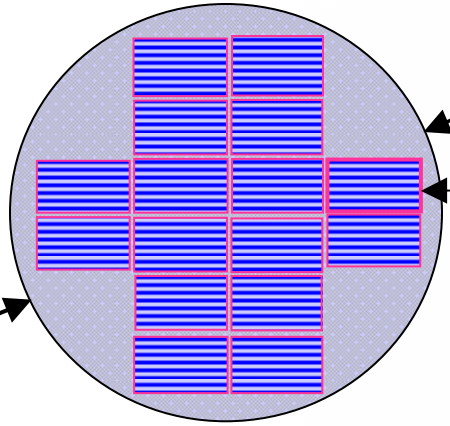
- **Wafer Fabrication options:**

Al2O3-TiC round wafer





Al2O3-TiC square subst.



Segments of rows
To be diced from the
Al2O3 - TiC wafer

~ 8" Dia. Al2O3 - TiC wafer

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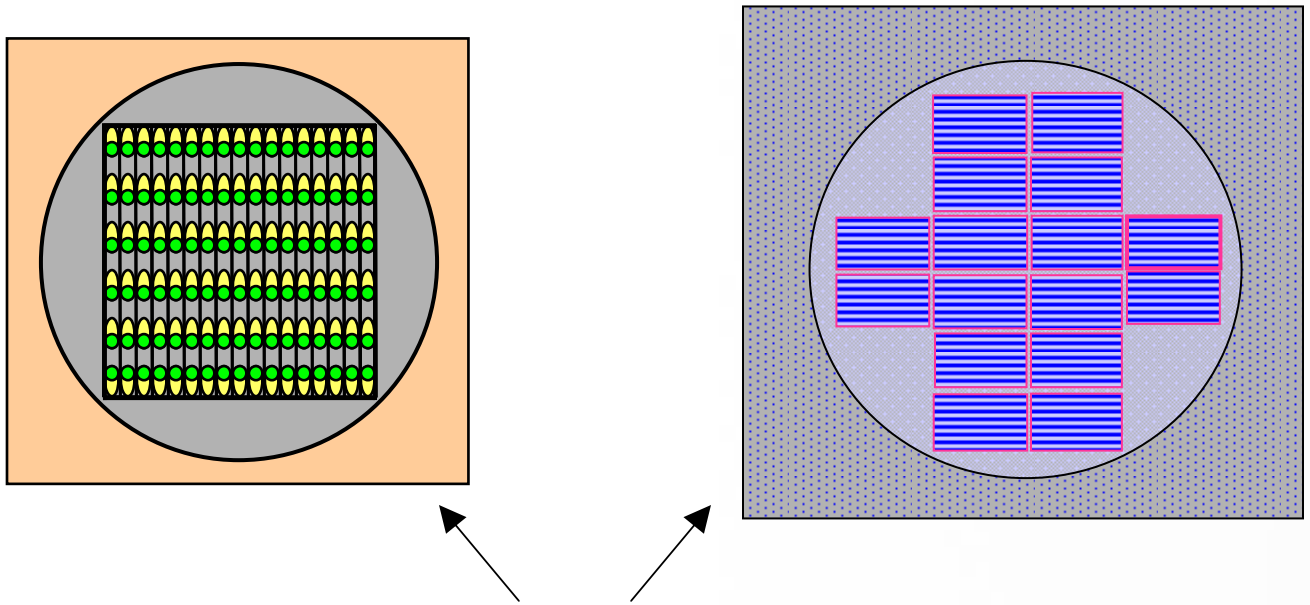
- **Wafer / substrate Mounting**

[Gluing or mechanical mounting]

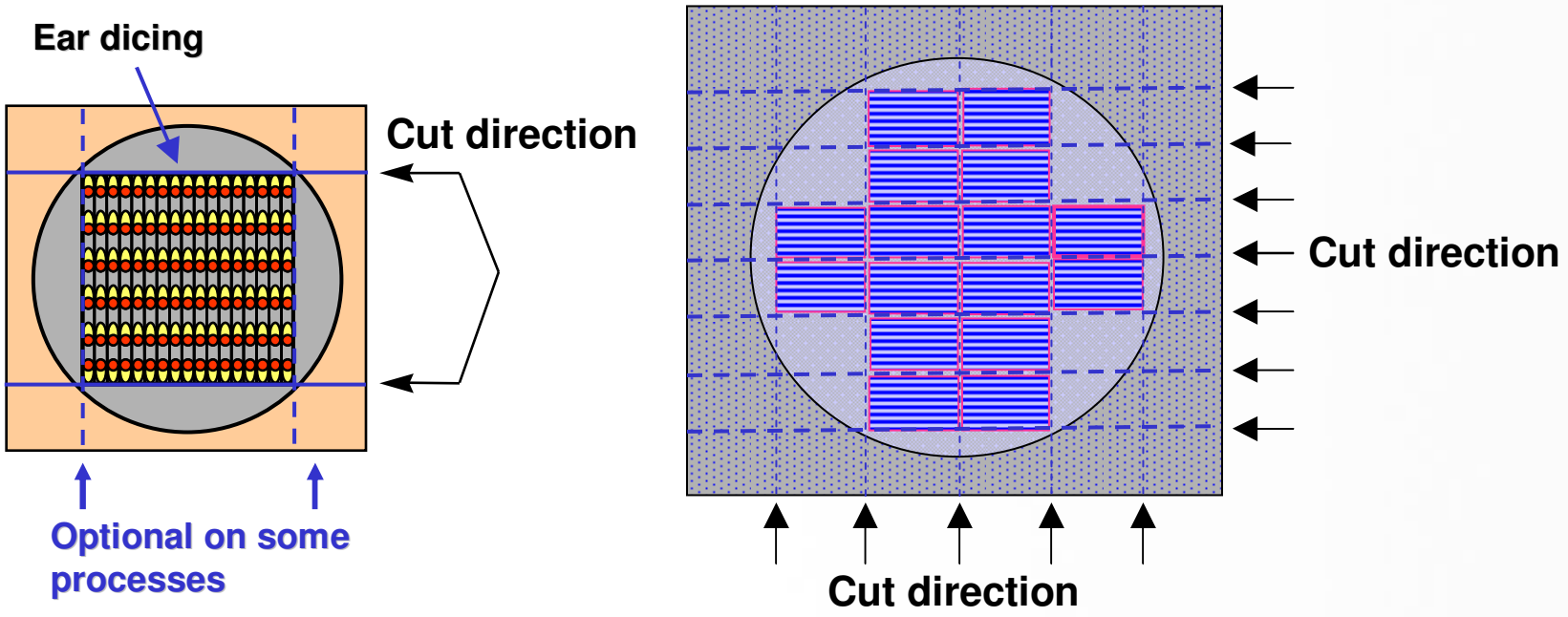


Lava or metal fixture

- **External shaping / Dicing :**

Blade - Depending on the process requirements:

- **Nickel or metal sintered x 4- 8 & 10mic. Diamond grit**
- **On some square substrates this step is part of the next row slicing process**



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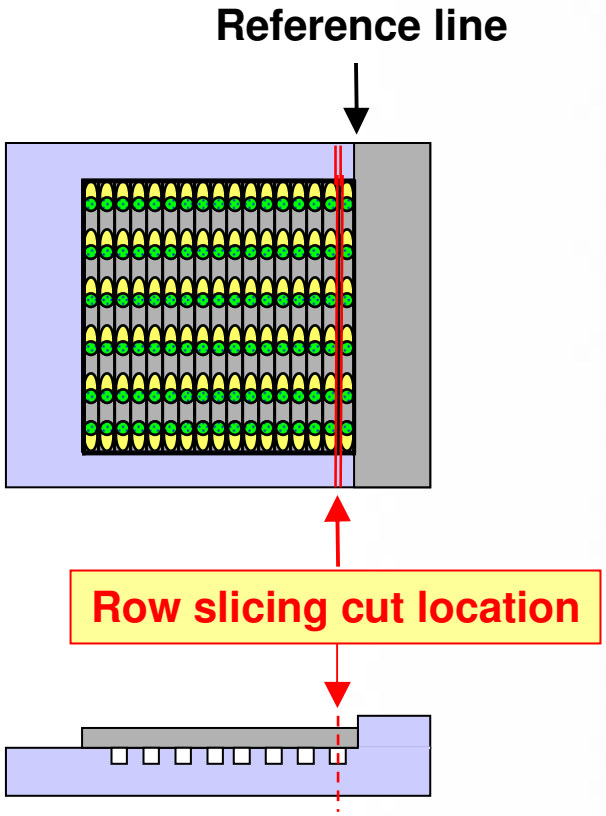
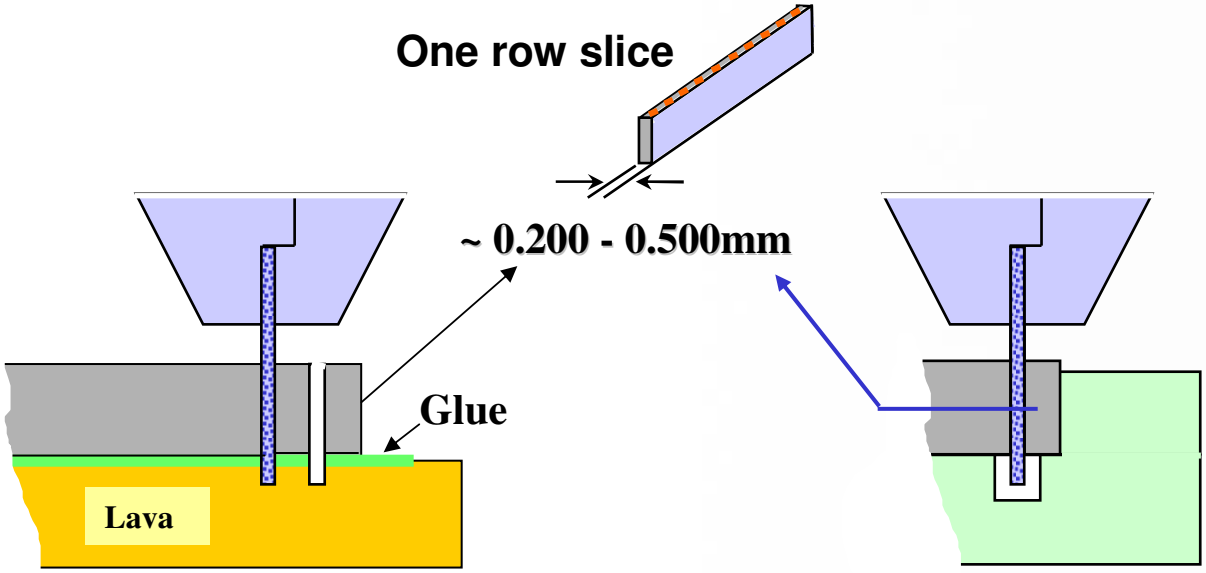
- **2nd wafer mounting [On some application]**

  [Glue or Vacuum to metal fixture]



• Row Slicing:

- Blade : Nickel electroformed x 0.100 - 0.150mm Thickness x 4- 8, 10 or 17mic. Grit
- Cut perpendicularity - ~ 0.002 - 0.005mm depending on wafer thickness
- Cut straightness [Skew] - ~ 0.002 - 0.005mm depending on cut length
- Chipping - ~ 0.004 – 0.008mm depending on the application (Usually not an issue)

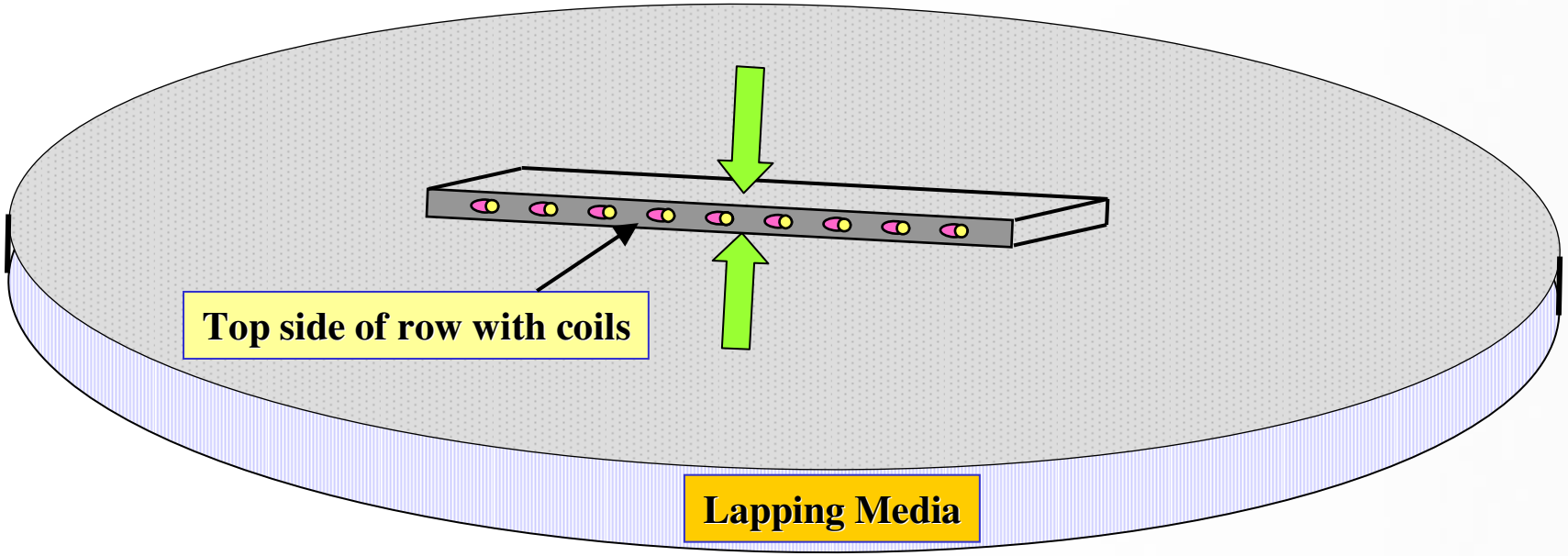


Row slicing on Lava

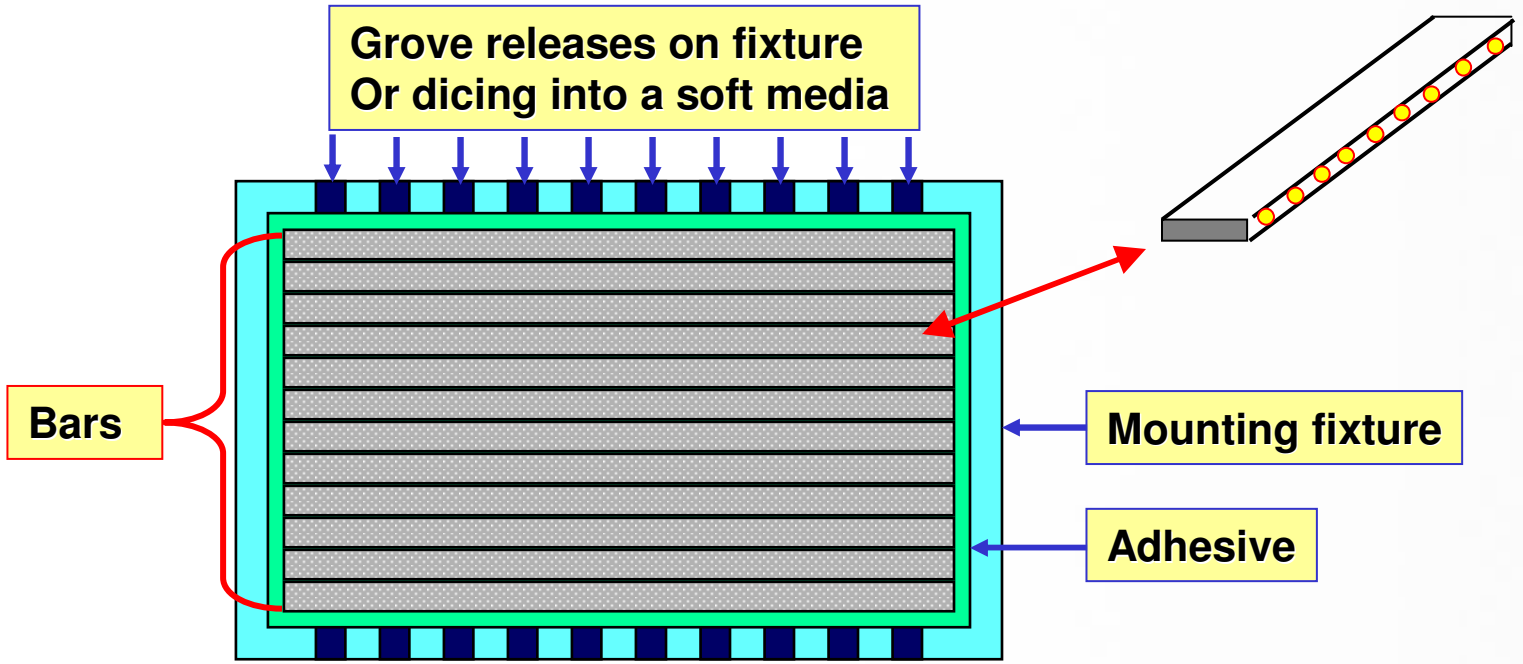
Row slicing on metal fixture

- **Lapping the rows in reference to the coil geometry:**

Lapping the row sides for straightness
& electrical properties



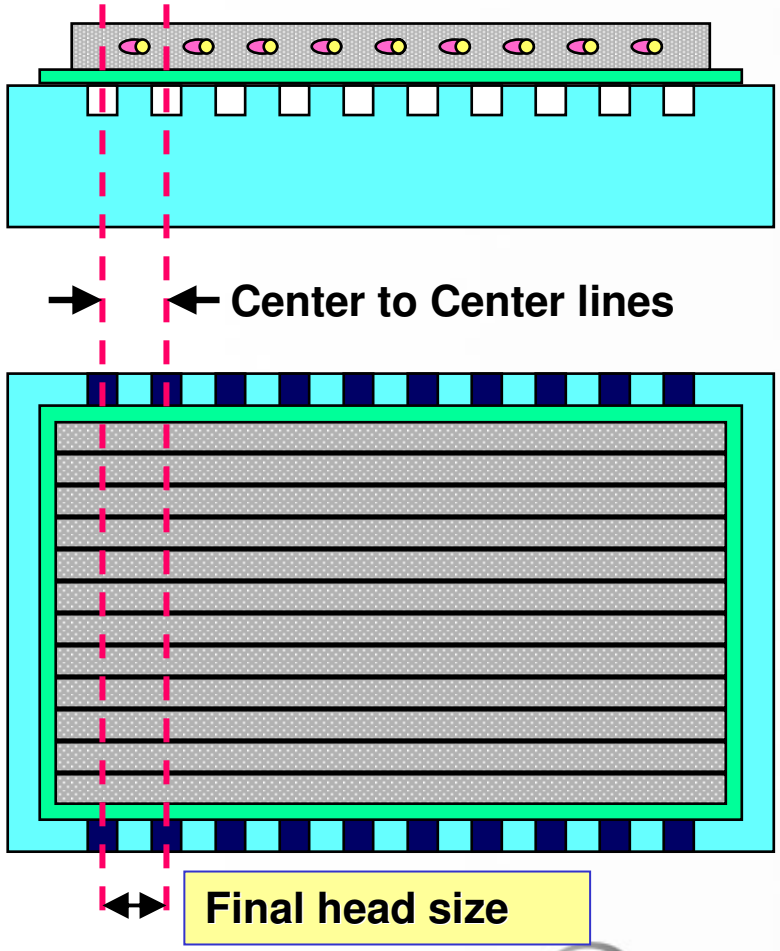
- **Aligning and stack mounting of rows:**
  [A delicate & accurate process]



Magnetic Head Slider

• Head Parting:-

Blade being used:
Nickel binder x 3- 6mic. Or 4-8 mic. x ~ 0.060 - 0.100mm thick
[On some application a thicker blade is used]



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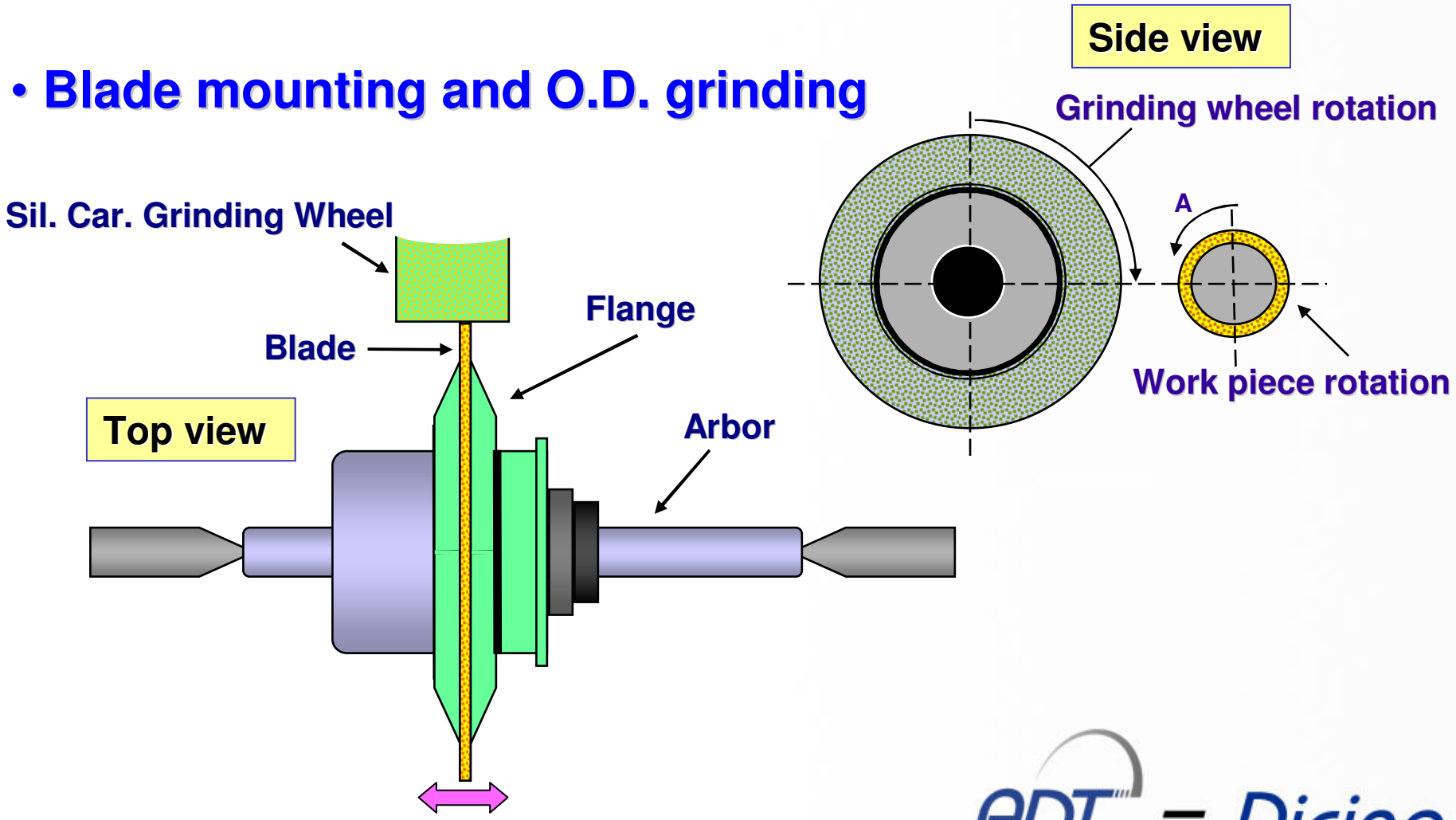
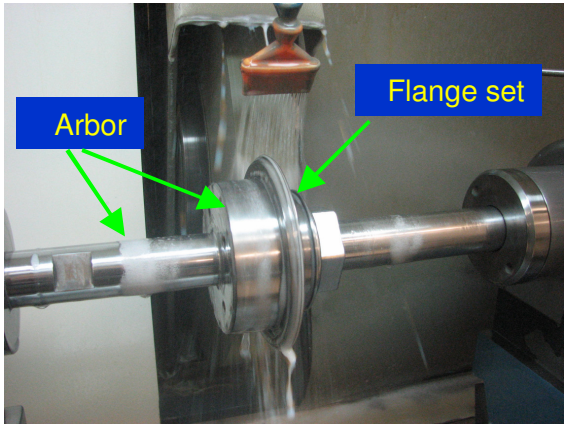
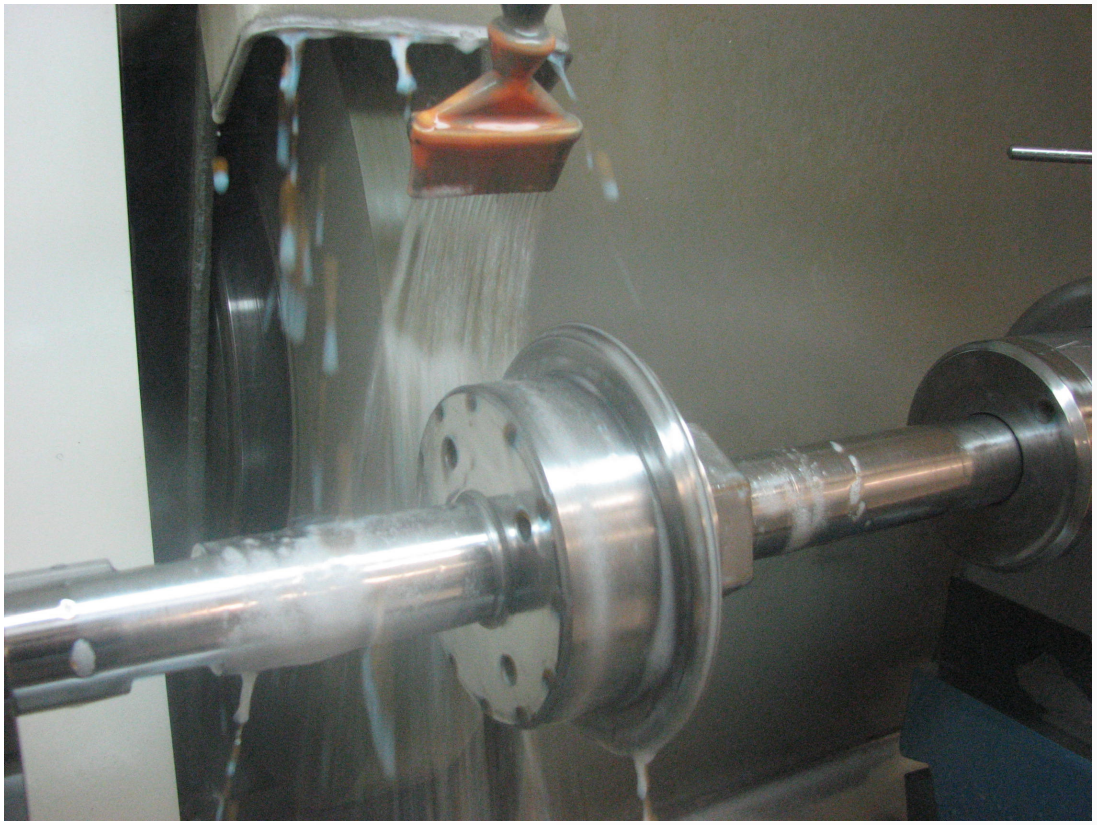
Important process parameters:

- **Blade mounting and O.D. grinding**



Magnetic Head Slider





O.D. grinding on the KOL cylindrical grinder

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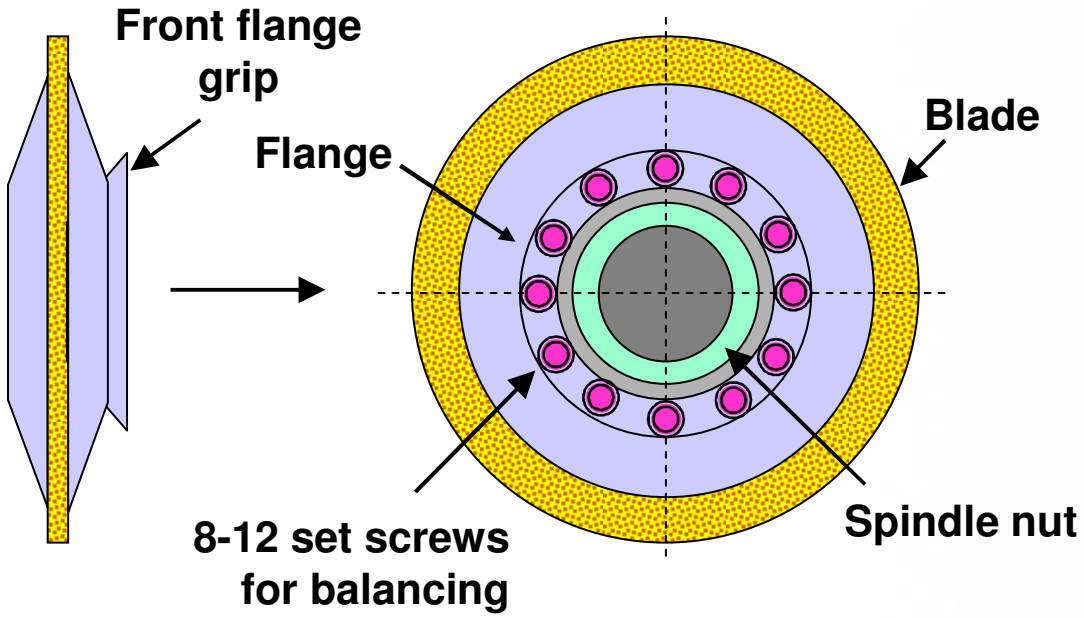
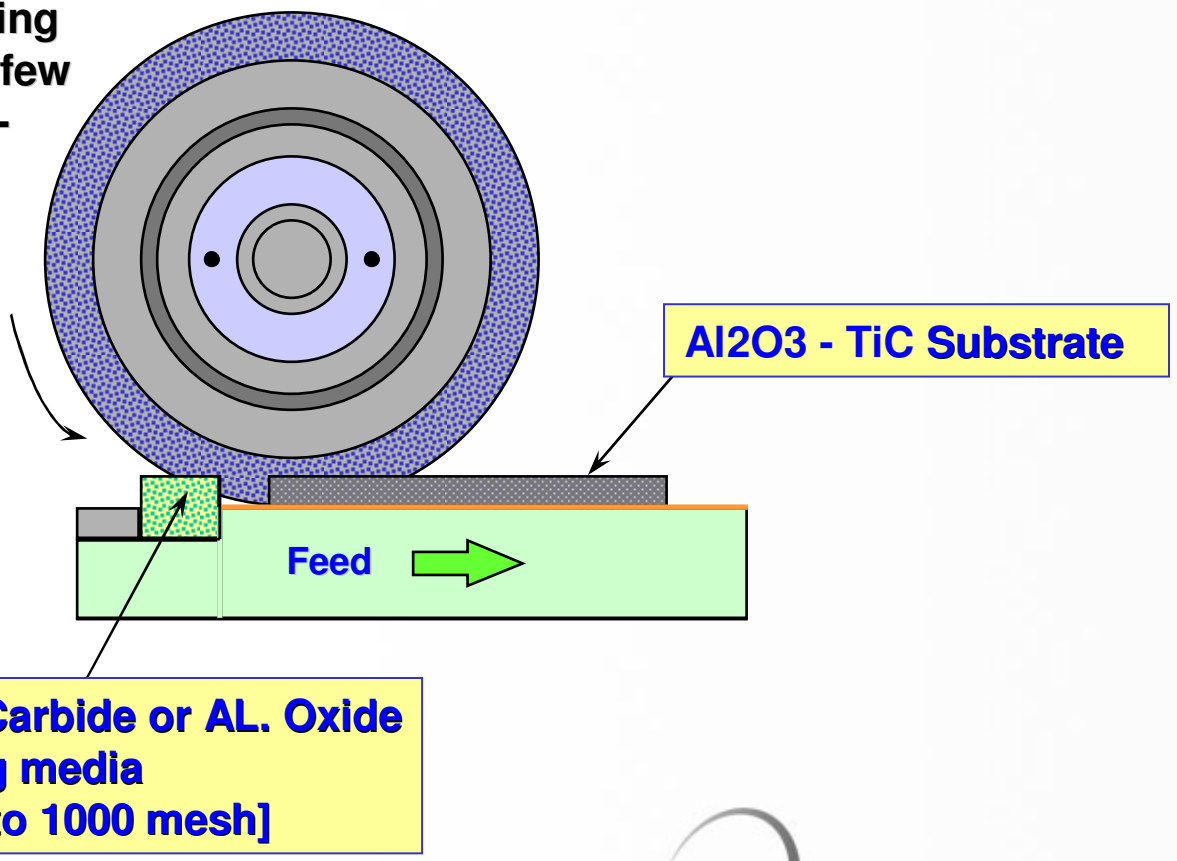
- **Blade Dynamically balancing: common spec - < 0.001cm / sec**



Cont.

• On Line dressing

- Blade is passing the dressing media each index or every few cuts on a dressing station -
- To be optimized.



Cont.

Blade testing for spec :

- Blade must be functionally tested on Al2O3 - TiC substrate after the O.D. grinding process and prior to starting production

Blade Coolant:-

- Special additive to the cooling system must be used to lower the surface tension of the coolant and to better lubricate the blade during the dicing.
- Use lower pressure with high coolant volume, Important to eliminate any blade deflection.

Cont.

Proper mounting:-

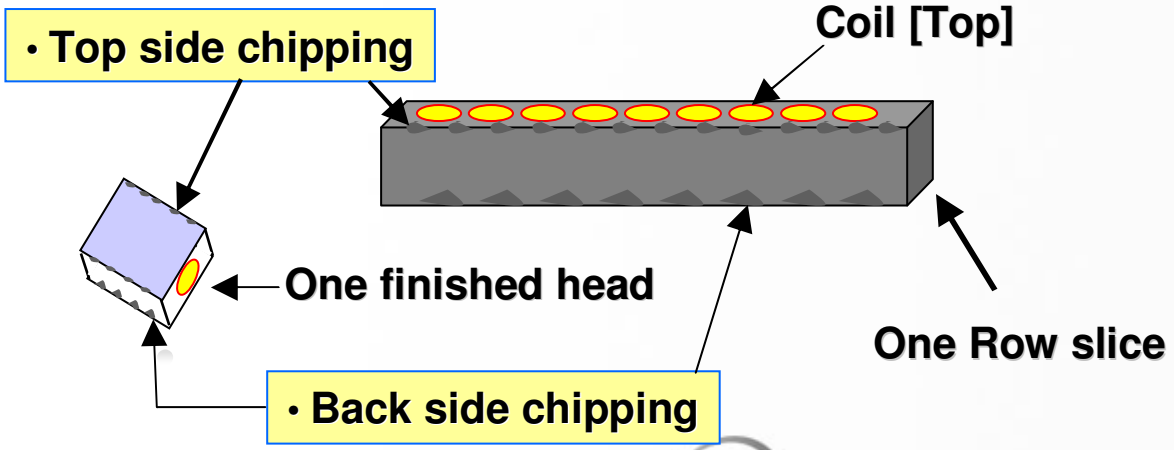
- Eliminate any movement of bars
  [Skew and blade Walk]
- Optimize the glue type to minimize blade overloading

Quality criteria's for the row slicing & the parting:-

General remark:
The quality criteria's spec depends on the customer application. All spec criteria's are in the microns range and do vary between customers

Factors effecting TSC & BSC:

- Substrate type (Material Thickness etc.)
- Blade matrix
- Diamond grit size & Conc.
- Coolant
- Blade vibration [balancing]
- Mounting
- Optimized dicing parameters



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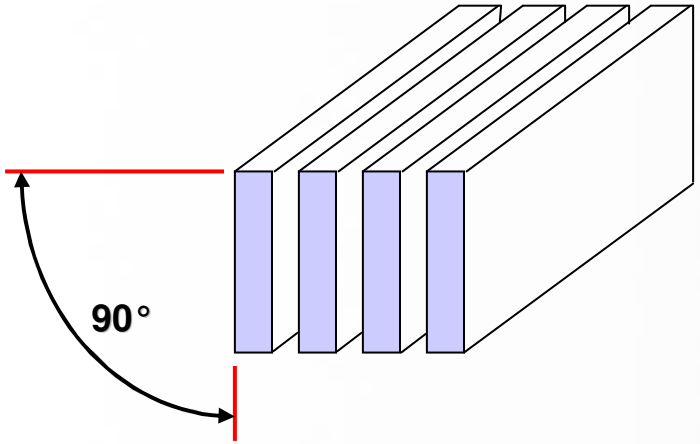
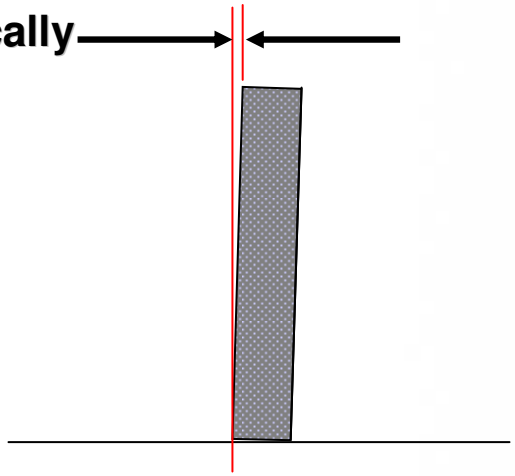
Magnetic Head Slider

- **Cut perpendicularity:**

Factors effecting cut perpendicularity:

- Blade matrix [Loading]
- Blade exposure
- Flange condition
- Coolant type and pressure
- Mounting
- Optimized dicing parameters





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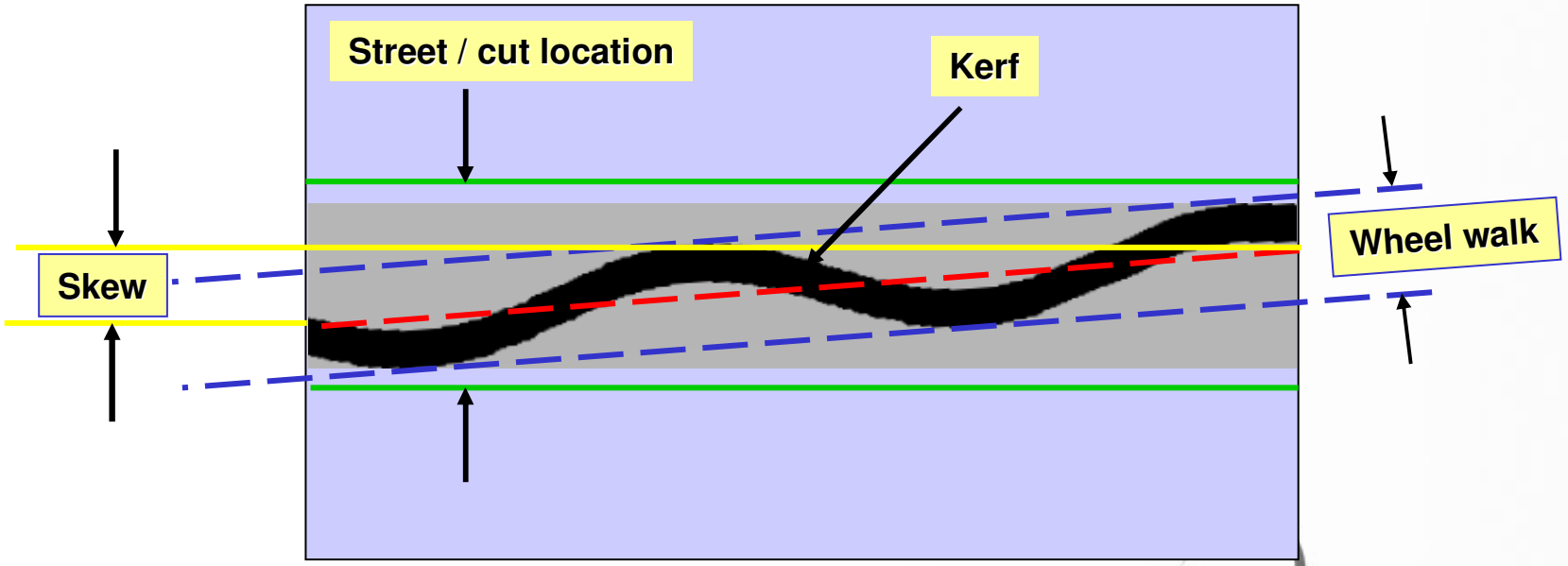
Magnetic Head Slider

- **Wheel walk & Skew:**

- Wheel walk is mainly a factor of the blade stiffness, blade exposure, wafer material [Loading] and the accuracy of the dicing saw
- Skew is mainly a factor of the blade matrix, part mounting / part movement during the dicing, wafer material [loading], accuracy of the saw [alignment] and accuracy of the wafer streets.

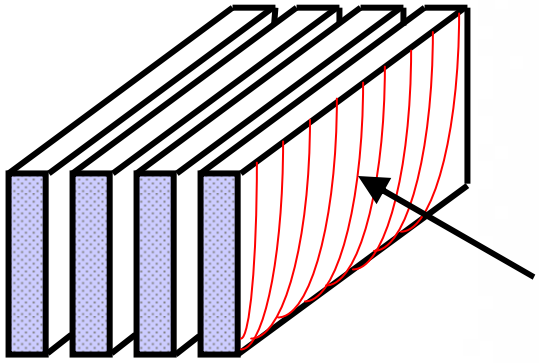


Magnetic Head Slider

- **Surface finish on the kerf wall:**

Factors that are effecting the surface finish:

- Blade binder & diamond grit size
- Wafer material
- Saw accuracy
- Blade exposure
- Spindle speed & feed rate
- Coolant type
- Blade vibrations - dynamically balancing
- Mounting



Surface finish
Measured in Angstroms

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ADT typical recommended blades for Dicing magnetic head applications:-

Row slicing:

- Nickel Electroformed - 4-8, 10 & 17mic. Grit Thickness of 0.090mm & over

Parting:

- Nickel Electroformed - 3-6, 4-8mic. Grit Thickness of 0.060mm & over

All blades are available in 2.0" [50mm] up to 4.30" [109.22mm] Diameters. Special diameters can be made.

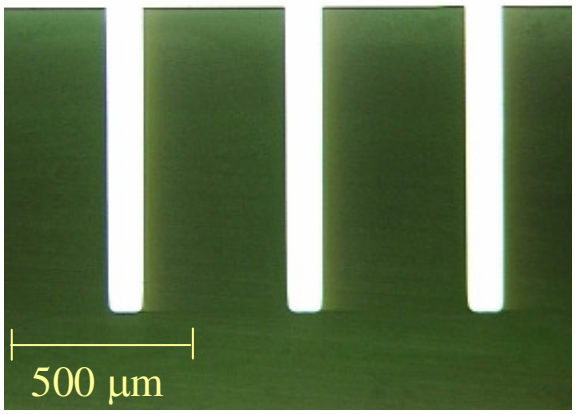
Other blade matrixes or blade parameters can be tailor made and optimized for special application requirements.

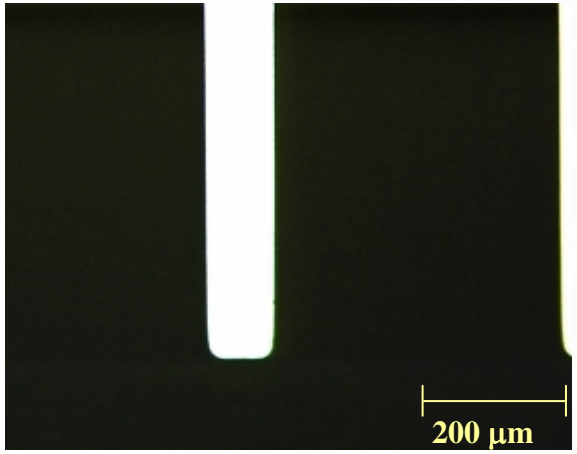
Magnetic Head Slider

Typical qualification tests for the Row Slice process:

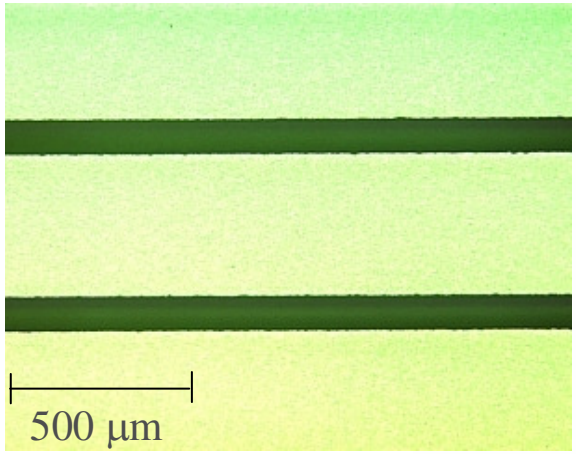
Blade P/N - 04776-7301-038-ALO

Blade thickness – 0.092mm





- Nice edge / min radius
- Kerf - < 0.097mm
- Min chipping



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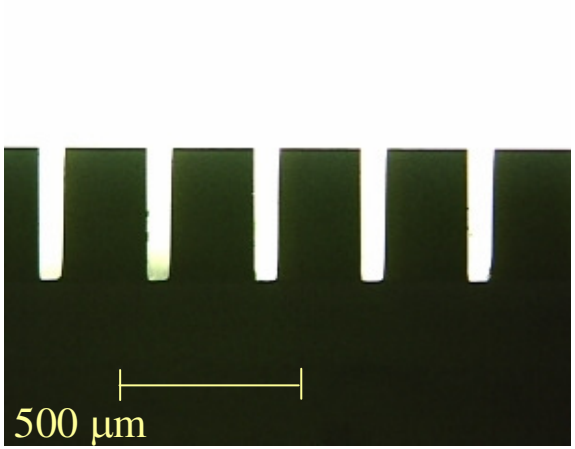
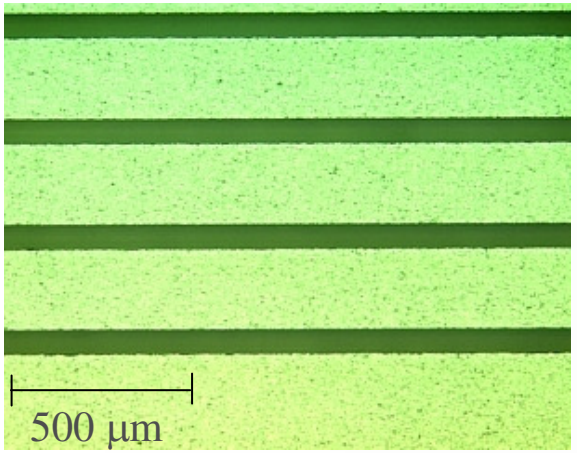
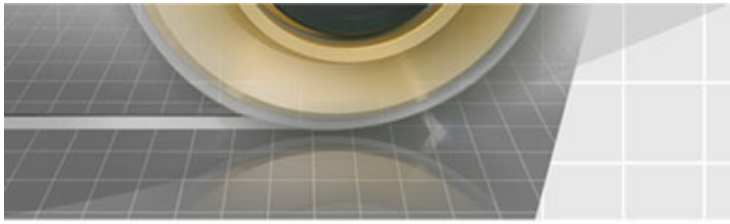
Typical qualification tests for the Parting process:

4B777-ENGN-135
Blade thickness – 0.062mm





- Nice edge / min radius
- Kerf - ~ 0.066mm
- Min chipping



Magnetic Head Slider

Blade P/N - ENGN-134 Wheel room test cut: **(At the customer site)**

Kerf – 0.064mm
Right perpendicularity – 0.001mm
Left perpendicularity – 0.002mm
Right radius – 0.008mic.
Left radius – 0.007mic.

Row part test after conditioning: **(At the customer site)**

Kerf – 0.065mm
Right perpendicularity – 0.002mm
Left perpendicularity – 0.001mm
Right radius – 0.008mm
Left radius – 0.007mm

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Blade parameters to be optimized:

- Blade geometry – Diameter, thickness
- Matrix hardness
- Diamond %
- Diamond size & type